# Card Grinding

## in Theory and Practice.

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*TREATISE No. 14.*

# CARD GRINDING

## IN THEORY AND PRACTICE.

(2nd Edition.)

A treatise upon the various methods of Grinding Card Clothing used by Spinners of Cotton, Wool, Silk, and other Textile Fibres,

embodying

THE INITIAL GRINDING OF CARDS BY THE CARD-MAKER.

THE MOUNTING OF CARD CLOTHING ON ALL CARDING ORGANS.

THE GRINDING OF CARDS UNDER WORKING CONDITIONS.

THE GRINDING OF AUXILIARY TEXTILE MACHINES.

THE STRIPPING AND BURNISHING OF CARDS.

**Dronsfield Brothers Limited,**

Atlas Works, **OLDHAM,** England.

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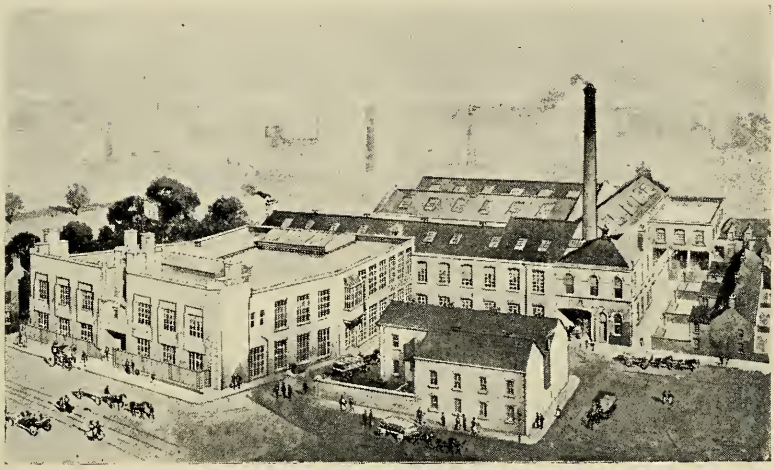

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# Foreword.

IT has been to us a source of unmitigated pleasure to see our last treatise entitled "The Grinding and Mounting of Card-clothing" so well received. Published some seven years ago, we find the edition of 5,000 now exhausted, and so greatly has the treatise been appreciated that even to-day we are in regular receipt of applications for copies of same.

The treatise is now in the hands of many thousands of people interested in the spinning trade.—Managers, Carders, and Students ; and we are pleased to know that it has come to be looked upon as the standard work on the important subject of Card Grinding.

Nevertheless, the demand for the treatise is still so great that we feel it incumbent upon us to issue a further and enlarged edition, being assured that a dissemination of useful knowledge gained by long practice and experience, cannot but be of mutual benefit to ourselves and our readers.

This work, following on so exhaustive a treatise as the last one, must of necessity possess much of the same matter, but we have introduced some new ideas and theories which we think will be appreciated by the student, practical or theoretical. We have also added matter relative to the Mounting, Grinding and Fettling of Woollen and Worsted Cards.

In presenting our new treatise, "CARD GRINDING in Theory and Practice" or "The Carder's Vade Mecum" to our clients we take this opportunity of saying that our services are always at their disposal ; we are always open to discuss and consider new ideas and, if necessary, make experiments with a view to furthering the practice of Card Grinding. Our

works are open to all bona-fide spinners in whatever capacity or branch, practical or theoretical, and we extend a welcome to all who wish to avail themselves of the invitation to come and see not only the results of our exertions in the shape of finished machines in our show-rooms, but the actual manufacturing processes.

**Quality** is our watchword ; only the best materials, the best labour, and the best machinery are good enough for us in the output of our specialities, and the steady advance in the demand for our productions is only the result of our ambition to supply machinery which is irreproachable in construction, finish and precision.

The contents of this brochure are but the crystallized results of our experience of over half-a-century in the manufacture of Card Grinding Machinery, coupled with the inestimable co-operation, in experiment, of our practical spinning friends, and a perusal of the following pages will, we feel sure, repay the reader.

If further information on any question is desired, we shall be only too happy to furnish same on receipt of a line.

DRONSFIELD BROTHERS LIMITED.

Atlas Works,

Oldham, Eng.

2nd Edition, 1922.

# Part I.

# The Initial Grinding of Cards by the Card-Maker.

MANY Managers and Carders have not been through a Card-clothing factory, *i.e.*, the works where the card-clothing is set and ground preparatory to its arrival at the spinning mill, and many who have had this opportunity have probably not had a full insight into the multifarious processes of card-grinding.

For their benefit and to generally simplify the conception of trade terms applied to card-clothing, we think it advisable to commence this treatise with a short resumé of the treatment of card-clothing by the Card-Maker. A little insight into this treatment will, in any case, assist the carder in the manipulation of the card-clothing under working conditions.

## Types of Card-Clothing.

Card-clothing as used on all carding machines is made in three forms, viz.—(1) **Fillets.** (2) **Flats,** or, as they are termed in this state, "**Tops.**" (3) **Sheets.**

**Fillets** are the most generally used for all purposes, viz. :—for clothing Cylinders and Doffers and Rollers and Clearers of Cotton Cards, the Swifts and Doffers and Workers and Strippers of Worsted Cards, and of many of the finer Woollen Cards. In addition to these organs Filleting is also employed in the clothing of Stripping and Burnishing Rollers, and the card-covered rollers of supplementary

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machines, for instance, Raising or Napping Machines used for raising flannellettes, cotton and woollen blankets, etc., Brushing and Cropping Machines.

**Flats or "Tops"** are used for covering the iron carding bars, denominated "Flats" of Revolving Flat Cards, the stationary wooden flats of Wellman type, and the flats of composite cards, *i.e.*, part Flats, part Rollers and Clearers.

**Sheets** play an important part in the clothing of Swifts and Doffers of Woollen Cards but are seldom used in the cotton trade at the present time. Certain cards for carding waste or a very low grade of cotton are sometimes covered with sheets owing to the clearing properties of the spaces between the sheets, which permit the heavy seeds, leaf, and dirt to escape; with a full filleted cylinder these impurities would be retained and the wire would become quickly choked. Sheets are also used on hand-stripping cards for clearing the cotton away from the rollers employed in the stripping of cylinders and doffers.

**Licker-in Clothing.** As being allied with Card-Clothing, must be mentioned the Licker-in Clothing. This is made in two forms: (1) Fillets of leather or very heavy cloth foundation of several ply in thickness, set with serrated wire. (2) Serrated Wire punched out in lengths; this wire is set vertically into the licker-in roller in deep grooves cut into the roller surface. This type of licker-in is termed 'inserted.' Licker-in Filleting is much used on woollen and cotton waste cards, but the inserted or 'Garnett' wire, as it is frequently called, is now used on all modern cotton spinners' cards.

In the following pages we will deal with the grinding of these various types of Card-clothing by the Card-maker, but in the first place let us discuss the various methods of the actual grinding and thus elucidate the difficulty of understanding the technical terms applied.

**All** Card-clothing is **surface-ground.** This is accomplished by the aid of grinding rollers, or emery-wheels, covered with grain-emery cemented directly on to the roller surface or applied in the form of emery-filleting; the latter system is now universally used.

Cotton and Worsted Spinners have been for many years and still are very partial to **side-ground** wire. Wire is side-ground for two main reasons.

**Reasons for Side-grinding.** Firstly, the space between the wires of the Card-clothing is increased by reason of the side portions of the wire being ground away, giving greater clearing facilities for the fibres and preventing undue choking of the wire by the retention of broken seeds, leaf, and other impurities.

Secondly, it will be understood that the abrasion by emery upon the wire teeth is not conducive to a polished effect, nor is it desirable to produce such an effect. On examination of a side-ground wire point with a microscope it will be observed that the surface of the wire is covered with a series of minute corrugations with fine jagged points or spikes of metal standing clear of the main body of the wire and all round the edges of the 'point.' These fine spikes are the fibre carriers and to them must be attributed the whole of the carding properties of the wire. When these points or spikes are worn or broken away, the card wires are no longer effective and must be re-ground to produce the 'spiked' effect. By means of the surface-grinders used in all mills the points are periodically abraded to reproduce the original effect, being aided in this by the slight roughening of the sides of the wire teeth resulting from the initial side-grinding.

'Side'-grinding and 'Plough'-grinding are termed "**Needle-pointing,**" but this term is a misnomer and calculated simply to convey the impression of extreme

sharpness. Card wire, pointed like needles and rendered perfectly smooth would be absolutely useless for the purpose intended, *i.e.*, to take hold of the fibres and hold them during the process of the combing action of the opposing teeth. The only resemblance to the needle is in its general form, *i.e.*, tapering from bend to point. Fig. 1 depicts a side-ground tooth. It will be observed that the base or root is left in its original form, viz. : round, permitting of a good grip in the foundation ; from the bend upwards the wire is ground away from the sides gradually tapering to the point. The top of the wire is afterwards surface-ground from back to front and a little on the edges leaving the point intensely sharp at its extremity.

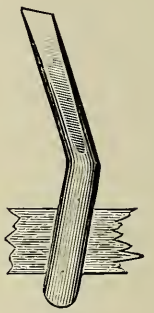


*Fig. 1.*

**'Plough'-grinding** is nothing more nor less than side-grinding, save that the result is accomplished in a manner somewhat different to the ordinary side-grinding method. The grinding wheels which perform the side as well as the plough-grinding operation are of consolidated emery and bevelled to a fine edge at their outer periphery Fig. 2 shows a side or plough-grinding boss fitted with these emery-rings or wheels which are mounted side by side on an iron disc and are held in position by india-rubber packings. "Plough"-ground Card-Clothing is now in great demand by reason of the regularity attained in the side-grinding of the teeth. We give a full description of the method of plough-grinding on page 16, in conjunction with the respective machine for doing this work Fig. 4.

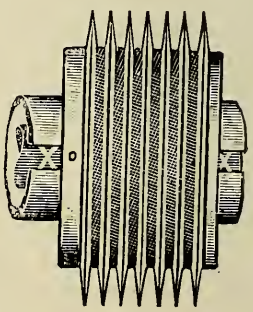


*Fig. 2*

Having thus dealt with the different types of grinding, we will now give a short resumé of the various machines in use by the card-makers for producing these results.

# The Grinding of Card Filleting.

The Machine most generally adopted for the complete grinding of Fillets, Tops, and Sheets, at the card factory, is the **Patent Improved Card Grinding Machine No. 24,** of which an illustration appears in Fig. 3, and this by reason of its capability to accomplish **all** of the grinding, both side and surface, simultaneously. This is the most generally useful grinding machine for card-makers, and is in use, variously fitted in respect to number and type of individual grinding instruments, in most card-makers' shops. The machine, when fully fitted, as illustrated, bears some resemblance to a Roller and Clearer Carding Engine with the carding-rollers replaced by grinders. The component parts of the machine, as illustrated, are comprised as follows :—

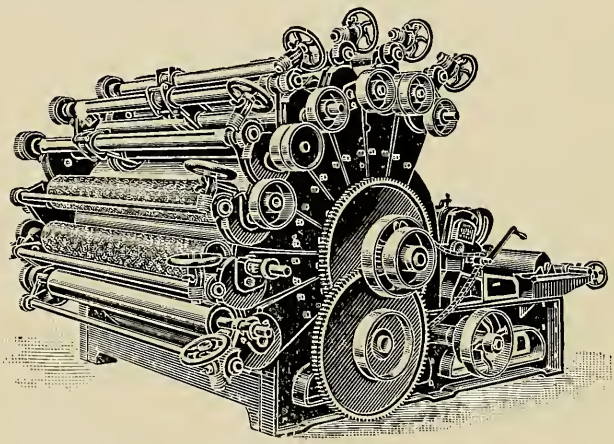


*Fig. 3.*
*Card Makers' Grinding Machine No. 24.*
*Codeword—Multum.*

Cylinder, mounted in pedestals, on the frame-sides. Arches carrying 8 pairs of Setting Motions, each pair of motions carrying its own grinder, and actuated by a single setting wheel.

Card Mounting Machine for clothing the cylinder with fillets with a given registered tension.

Sheet Stretching Apparatus, with tension screws, for carrying Tops or Sheets whilst grinding. (These are made into an endless band which is passed around the cylinder and the roller of the Stretching apparatus; in this manner the band of tops or sheets, as the case may be, is caused to revolve with the cylinder by frictional contact.)

3 Side-Grinders, for 'needle pointing,' on the traverse wheel principle.

2 Surface-Grinders, on the traverse-wheel principle.

2 Long Surface-Grinding Rollers.

1 Burnishing Roller to remove the 'arage' and rough barbs.

Thus fitted the machine is capable of dealing with the card-clothing as it comes from the card-setting machine, grinding it both on the sides and surface, burnishing it and leaving it ready for dressing. All this is done simultaneously. The Long Grinding Rollers serve to take off quickly the gross irregularities in the height of the card teeth; the surfacing Traverse-wheel Grinders finish off the points and leave the surface of teeth perfectly parallel and cylindrical; the Side-Grinders operate upon the sides of the teeth from the bend to the point to produce the "needle-pointed" effect.

**Plough-grinding** is done by means of a machine which has been specially designed to do this work, viz.:—

**The Patent Plough-Grinding Machine for Card Fillets,** No. 21, Fig. 4. Plough-grinding is a distinct and separate process, and after the filleting has emerged from the machine it must be afterwards surface-ground in other types of machines. Plough-ground Card Filleting is now in great favour with cotton spinners, and the reason may be accounted for by the fact that every tooth receives equal abrasion, resulting in perfectly even wires all ground to one section and to an equal depth. The windlasses

shewn are placed one in front and the other at the back of the machine; these carry the coil of filleting which is drawn through the machine along the Bed (A) and under the grinding Heads (BB) by the Pull-off Motion (E). Each grinding head carries a set of 4 bevel-edged consolidated emery wheels, the second set of rather finer grain than the first. Before coming into contact with the emery wheels each of the 4 furrows to be operated upon comes into contact with a "plough," which gently opens out the furrow and throws the two lines of teeth back until they reach the abrading point of the emery-wheel, at which point they close on to the wheel one line on each side. Figs. 5 and 6 shew clearly the ploughs and their furrowing action. From these ploughs this particular type of grinding takes its name.

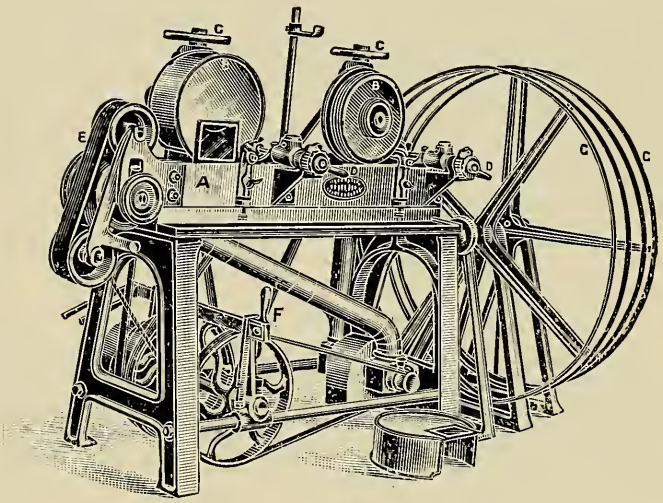



*Fig. 4.*
*Patent "Plough" Grinding Machine for Card-fillets, No. 21.*
*Codeword—Plowgrind*

It will at once be recognised that as every furrow is in turn treated as described, every tooth receives equal abrasion and the result is more positive than by the somewhat uncertain side-grinding action of the traverse-wheel on the cylinder

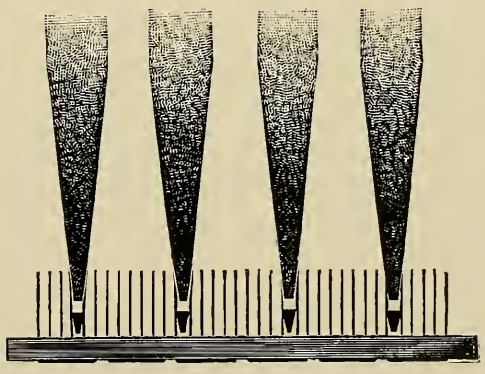


*Fig. 5.*
*'Ploughs' in action.*

machine. It must be borne in mind, though, that "plough"-grinding is a much more lengthy process than the ordinary side-grinding previously described, and it is more costly to produce. With a 2 inch Cylinder Fillet, 100's, of 48 teeth in the width, it will be seen that the fillet will need to pass through the machine 13 times, *i.e.*, 48 ÷ 4 + 1 for the edges.

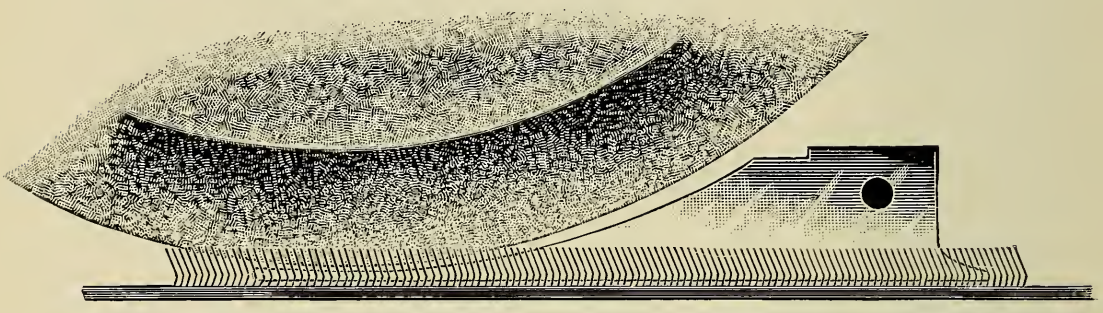


*Fig. 6.*
*'Plough'-Grinding: Wires in Contact.*

After each passage the fillet is rewound from the delivery-windlass to the starting windlass and the succeeding 4 rows are operated upon; the fillet-guides are controlled by a rack and pinion arrangement pitched to the wire setting. After the plough-grinding operation the fillet must be surface ground and burnished, so as to produce a true surface of points and eradicate any roughness or burr which the frictional contact of the emery-wheels has left on the sides of the wires. If the wires should be left without burnishing they would have a tendency to cling to and retain the fine fibres, seeds, and neps which would gradually become 'felted' and resist the stripping operation.

**The Patent Automatic Surface-Grinding Machine** No. 16, Fig. 7, is specially adapted for surface-grinding (only) card-filleting in a continuous length; for instance, fillets which have undergone the plough-grinding operation and all woollen manufacturers' and other fillets which require surfacing only. This is a very useful and economical

machine for the purpose, as the feed and delivery motions are automatic. The machine is fitted with a safety stop-motion to stop the machine automatically in case of obstruction arising which would be liable to break the card-filleting. The grinding is accomplished by 3 Long Grinding Rollers.

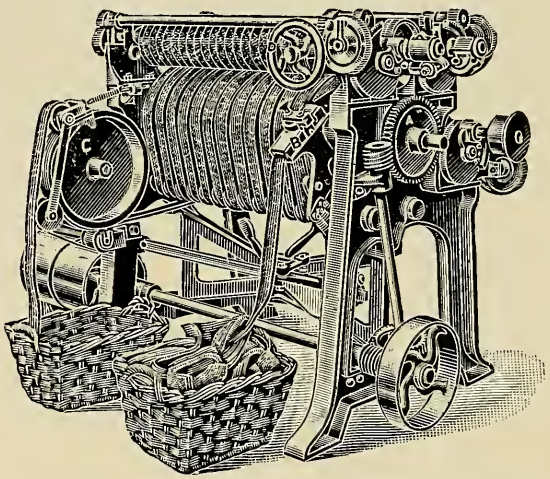


*Fig. 7.*
*Patent Automatic "Surface"-grinding Machine, No. 16.*
*Codeword—Autogrind.*

The fillet is fed through a card-trough in which it receives the necessary tension by means of an adjustable tension-plate; from the trough it passes round the carrier-cylinder over which it is wound in 12 laps. From the cylinder the filleting is taken by the Pull-off Motion (C) which transfers it to a basket (or windlass as desired). In its passage over the cylinder the filleting is guided by two rows of cones placed underneath; these cones are so arranged that the laps are presented vertically, not tangentially, so that there is no disposition of the filleting to 'shunt' in its passage. The traverse given to the grinding rollers is a distance calculated to cover the space between the laps of card-filleting, in this way avoiding the possibility of 'ridging' the surface of card-teeth and at the same time bringing into action the full body of emery-surface.

## The Grinding of Card Tops and Sheets.

**Card Tops** and **Sheets** are now, in the most modern machines, set in continuous form, but originally (and many machines of this description are still in use) card tops (flats) were set in separate sheets of three wide and four narrow tops

to a sheet. As already explained in describing Machine in Fig. 3, these are usually ground in an endless band, the sheets being sewn side by side; this band when passed over the cylinder and stretching roller has the appearance of a wide driving-belt. In many cases, however, it is necessary to operate upon the sheets singly.

**The Patent Side-Grinding Machine for Tops and Sheets** No. 15, Fig. 8, is specially designed for this work, and in addition, it may also be used for surface-grinding the cards after the side-grinding process.

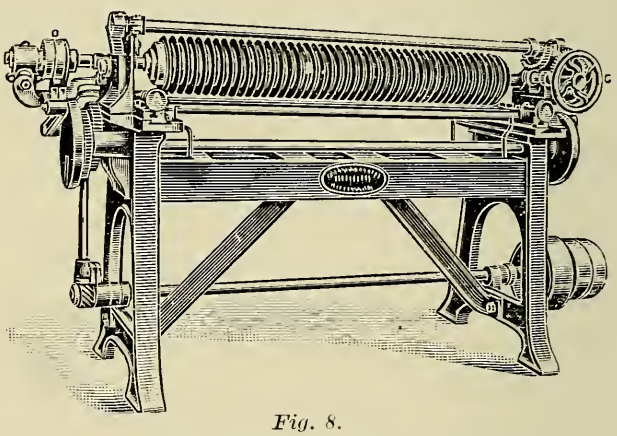


*Fig. 8.*
*Patent Card-Sheet Grinding Machine, No. 15.*
*Codeword—Sheetgrind.*

The Sheet is placed on the bed-plate under the grinder and secured by clamps with stretchers of which the screws (A) act as tighteners. The bed-plate carrying the sheet is traversed regularly to and fro across the slides by special gearing. The "side"-grinder employed (B) is of a different type to those used in machine Fig. 3. It consists of a roller upon which are mounted a large number of emery rings of the type already described, held apart by turned iron packings of equal thickness to ensure the rings being spaced equi-distant. This roller is fitted with a traversing motion which is calculated to give one complete traverse to and fro in 24,000 revolutions, a speed of traverse which is almost imperceptible but nevertheless positive; by this means the teeth are not mutilated nor violently abraded.

Owing to the careful adjustment of the emery rings and the corresponding traversing distance, every ring operates upon its own allotted section of card-wire, and the risk of missed teeth and doubly-ground teeth is eliminated. For surface-grinding, the side-grinding roller is replaced by an ordinary long emery-covered roller.

After the grinding operation the sheets are cut up into separate "tops" and are ready for mounting upon the iron bars or flats, the flats of the Revolving Flat Card with which everyone is familiar.

# Part II.

# The Mounting of Card-Clothing.

## Clothing Preparations.

### 1. The Grinding of Bare Cylinders and Doffers.

BEFORE dealing with the Mounting of Card-Clothing upon the cylinders, doffers, and other carding organs, the surfaces of these latter should be carefully examined, and if they should display any irregularity, either across the face or cylindrically, they should be ground true by the Bare Cylinder Grinder. In the case of old cards the cylinders and doffers should be always ground in order to remove the roughened and consequently irregular surface of "burrs" caused by the constant rubbing of the teeth-crowns of the card-clothing.

The plugs should be carefully examined; loose, broken, and sunken plugs replaced, and swollen plugs trimmed flush with the cylinder face.

It has come as a revelation to many that this bare-surface grinding of cylinders and doffers should be necessary, but the necessity may be quickly verified by an actual test. A reliable and convenient means of testing may be utilized in the shape of the tube of the Traverse Wheel Grinder set in the grinding steps; with an improvised feeler to slide along the tube a chalk-test will very quickly display the irregularities both transversely and circumferentially.

There are several causes of the irregularity displayed in the surfaces of cylinders and doffers of carding-engines. All makers of these machines grind these organs at the works, but

even taking it for granted that they are faultless when they leave the works, it has to be borne in mind that the transport of same, transhipment from wagon to train, train to wagon, wagon to mill, and in the case of foreign shipments the duplication of this handling, is conducive to destroying their truth and accuracy. Add to this the re-insertion of the shafts and the re-erection of the card at the mill and it will be readily comprehended why cylinders and doffers need to be ground.

This is speaking of new machines only; with old machines, or rather those which need to be re-clothed, it is a surprising fact that the surfaces of the cylinders and doffers are almost always untrue; usually there is a declivity in the centre in the form of a band of from 8 to 12 inches wide; the cause of this has not been fully diagnosed; some deem it to be atmospheric effect upon the fibre of the metal, but whatever the cause there the defect is and should be corrected.

By mounting card-clothing upon cylinders and doffers without first truing them up upon their bare surfaces, much more grinding of the filleting is necessary after mounting. We compute that, on the average, this extra grinding is tantamount to a loss of wire equal to anywhere from 6 to 12 months working life of the clothing. It should be borne in mind that the card-clothing when new is at its best; the points are at their finest and the wire is best tempered on its outer skin. With harsh grinding for days at a time (three and four days of constant surface-grinding to obtain the requisite true surface of points is not uncommon) the points are thickened and the wire softened to a considerable extent.

As will have been seen in the foregoing pages the card-clothing has been carefully ground and prepared by the card-maker in such a manner as to necessitate very little grinding after mounting, so little in fact as should compensate the slight irregularity caused in the surface of points by the mounting process. A few hours should suffice for this. The

Truing-up of Cylinders and Doffers is accomplished by means of the **Patent Bare-Cylinder Grinder, No. 92,** Fig. 9. This grinder has been specially designed for this work and is now in universal use; particular attention has been devoted to the construction of this apparatus in order to produce a very strong substantial machine capable of sustaining the severe work which it is sometimes called upon to perform. Many carders have known and recognized for years the necessity of remedying the defects under question, and previous to the invention of the specially-designed Bare-Cylinder Grinder, for want of a better appliance, utilized the traverse-wheel grinders used for grinding the card-clothing. These latter are not built to stand the strain of heavy bare-surface grinding, and many grinders have been spoiled in this way, and rendered unfit for the work they were designed to perform, viz.: the grinding of card points.

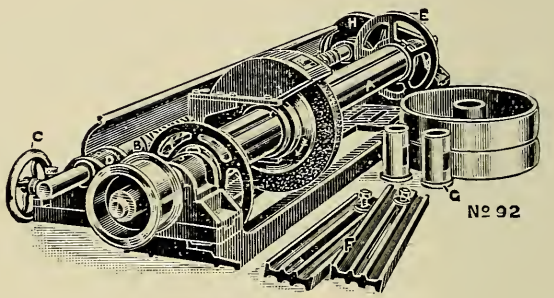



*Fig. 9.*
*Patent Bare-Cylinder Grinder, No. 92.*
*Codeword—Baregrind.*

The Patent Bare-Cylinder Grinder is constructed on the traverse-wheel principle; the wheel which is composed of consolidated corundum, is mounted upon a stout steel tube and is connected therewith by a key-way; the tube is not slotted through as in the usual grinder, thereby maintaining great rigidity under grinding pressure; the traversing screw is placed outside the tube in separate bearings and controls the traverse of the grinding wheel by means of guide-rods on both sides of the wheel-boss. We have lately improved this grinder in several details; the grinder-tube and screw are now so arranged that when moved at either end by the setting-

screws actuated by the hand-wheels, they do not lock or bind in their bearings but swivel upon pivots. The traversing-screw which formerly was driven by a separate pulley now receives motion from the tube end through a chain-drive, thus simplifying the driving in general and permitting the whole apparatus to be operated by one belt. The method of using the apparatus is as follows :—The Bed is placed across the frame-sides of the carding-engine contiguous to the cylinder or doffer as the case may be. The two eccentric setting rings are placed on the tube, one at each end, and the tube is turned round by hand until the grinding wheel in the centre and the rings at the ends are touching simultaneously the surface of the cylinder. Having thus obtained the parallel, the bed of the apparatus is bolted to the framing and the belt passed from the pulley on the cylinder shaft to the pulley of the grinder. The cut is controlled by the hand-setting wheels. The loose plates shewn in the Illustration are intended to bolt upon the card-framing on the doffer side or any such position where the framing is too short to carry the bed of the apparatus. The bushes serve to build up the various sizes of cylinder and doffer shafts to the size of the bore of the driving-pulley. The Grinder is now gradually fed closer and closer by means of the setting hand-wheels until the grinding wheel is touching all across and all around the cylinder. There is no specified time which can be allotted to this bare-surface grinding as this depends on the amount of irregularity presented by the organ under treatment ; the only limit is the one stated, viz. :—when the grinding contact is fully established on every part of the surface.

The ultimate advantages gained by this grinding of the bare cylinders and doffers will be a great saving in wire and the obviation of "blisters" in the filleting after the mounting operation, these causing loose teeth-crowns and other defects which are so great a bugbear to the carder when grinding and setting his cards.

## Clothing Preparations.

## 2. Revolving Flats.

When re-clothing the Flats of Revolving Flat Cards, the bevelled ends or seatings of the flats should be examined to determine their condition in regard to irregular wear and consequent alteration of bevel, and if they are found to be imperfect they should receive attention before re-clothing. Every maker of revolving flat cards has his own particular idea of the amount of bevel or 'heel' which it is necessary to give to the flats in order that the flats shall be presented to the cylinder tangentially, permitting of an inclined space the wider portion of which allows the cotton to enter, gradually decreasing until the 'toe' of the flat is reached at which point the line of wire is nearest the cylinder. There is actually very little difference in the degree of bevel employed by the various makers to produce this result, but it is absolutely essential that all the flats of any one make should possess and retain as nearly as practicable the same degree of bevel so that they should all be presented alike to the cylinder. However, the wearing of the seatings is inevitable, and, as no two pieces of metal wear alike, the flats eventually assume bevels which possess different degrees of angle on their end-seatings. It behoves the spinner to pay particular attention to the condition of the flat-ends before re-clothing, as should they be neglected, trouble will assuredly follow in bad setting and irregular carding ; apart from this the new card clothing will be badly punished by the endeavour to true up the flats one with the other so as to have the same height of wire from the seating-face to the point.

One of the most common forms of wear in the bevelled flat seatings is the 'shoulder' caused by the incessant rubbing of the seatings on the bends of the card ; this shoulder sometimes 'rides' on the bend lifting the flat right away from its carding position. Fig. 10 illustrates this type of wear.

*Fig. 10. "Shoulder" Wear.*

Another form is the rounding-off of the flat sliding-surfaces of the seatings at the point where they come into contact with the bends on entering the cylinder from the non-working position, and again upon leaving the cylinder, over the respective sprocket wheels. In the former position the front edge of the seating is presented first and slides for some distance before the full sliding face comes into contact with the bends, causing a gradual unevenness of wear and resulting in a rounding-off of the edges. The same thing is repeated with the back edge of the seating on the exit of the flat from carding contact. This 'rounding-off' is shewn in Fig. 11. It is vital that these defects be removed before re-clothing the flats; during the past few years Card-makers and Machine-makers have paid some attention to the matter in question when the flats have been sent to them for re-clothing, but up to recently, cotton-spinners far removed from the card-works, upon whom it devolves to perform, themselves, all this kind of work upon their own premises, have been met with a serious dificulty in the absence of a moderately-priced machine for doing this work. The machines for milling flat-ends as used by the makers were expensive articles and demanded some little skill to manipulate. The lack of a special machine to permit the spinner to cope with this difficulty exists no longer. **The Patent Flat-End Milling Machine,** No. 102, Fig. 12, was designed a short time ago expressly for use in the cotton mill, and incidentally, completes the range of machines which are necessary for the clothing of top-flats by the spinner on his own premises. Having in mind the necessity

*Fig. 11. "Rounding-off" Wear.*

for a simple machine, we have designed one which requires practically no skill to operate, and which does the work quickly, accurately, and automatically. All that the operator is called upon to do after setting the position of the cutters (and this is simple) is to insert the flat and push it forward into milling contact. While the milling operation is taking place he detaches the flat which has emerged finished and secures the next flat in position The machine is arranged to take all lengths, all widths, and all makes of revolving flats, and few change-pieces are necessary. The principle features of the machine as seen in the illustration are as follows :—

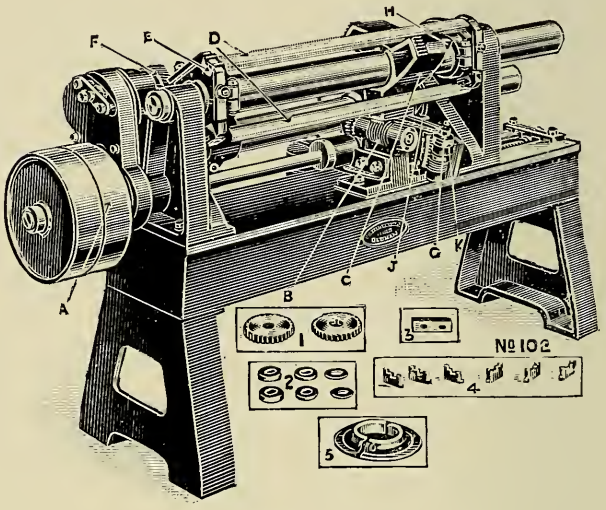



*Fig. 12.*
*Patent Flat-End Milling Machine, No. 102.*
*Codeword—Endmill.*

C. Flat-carrier, which revolves and carries the flats into milling contact. D. Flats, of which three are in the machine at one time. E. Changeable seating-bevels. F. Milling Cutters, one at each end working simultaneously. G. Setting-Screw for controlling the 'cut' of the millers. K. Indicating setting-ring graduated in 1/1000's of an inch. The milling of the flat-seatings is continuous and the operation is completed at one stroke. The Cutters are controlled by a 'former' which possesses a profile of the contour desired as shewn in Fig. 13. The result is a new bevelled face with a smooth finish ; it will be noted that not only are the flat sliding

faces milled during the operation but the hollow segment also. By thus perfecting the bevels, the work of grinding and setting the flats is very much simplified ; better carding is bound to result and the carder is saved much worry and anxiety.

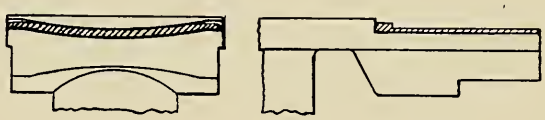


*Fig. 13.*
*Contour of Milling Cutters.*

**3. Rollers** and **Clearers** of Cotton Cards, and **Strippers, Workers** and **Fancies** of Woollen and Worsted Cards should be carefully examined and put into thoroughly good condition before mounting the card clothing upon them. The barrels should be freed from tacks and afterwards, in the case of wood rollers, turned up to a true surface. The shafts should be tested in regard to their concentricity with the barrels and, if necessary, stretched. Rollers with shaft-necks unduly worn should be fitted with new ends. The apparatus for turning up wood-rollers is that illustrated in Fig. 28, page 47 ; this frame serves a double purpose, viz. :—for turning-up primarily, then for clothing the rollers (with filleting) in conjunction with the Card Mounting Machine Bed and Tension Apparatus described on pages 31-32. When used for turning-up, the card-roller is placed in the lower steps of the Frame and the turning-up rest (C) (shewn on the floor, Fig. 28) is mounted on the bed or slide of the machine in place of the tension apparatus. The roller is rotated from the under-driving shaft.

**Strippers** and **Workers** are frequently turned-up on the grinding frame, in cases where the frame sides are adapted to receive the bed or slide. A simple but effective and useful Hand Turning-up Apparatus for application to Grinding Frames of the type mentioned (such as will be seen in Figs.

50-51), is illustrated in Fig. 14. This apparatus requires no description ; the bed is simply bolted on the framing of the grinding machine, and the turning-up rest carrying the tool is pushed along from end to end of the slide. Needless to state, during the process of turning up, the stripper or worker is mounted in the steps usually occupied by the grinding roller and receives motion from the same pulley as the latter.

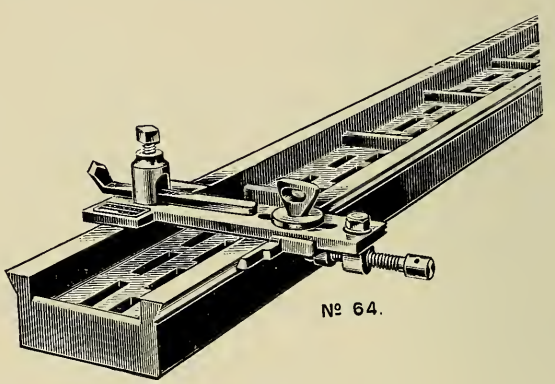



*Fig. 14.*
*Hand Turning-up Apparatus, No. 64.*
*Codeword—Handturn.*

# Card Mounting.

## 1. Cylinders and Doffers.—Filleting.

THE Clothing of the various organs of the Carding Machine is a most important process, and this work should be performed in the very best manner possible by the aid of the most up-to-date appliances procurable. The manner in which the card-clothing is applied has a direct and lasting influence upon the quality of carding produced; careless mounting will be certain to produce bad or indifferent results in the form of cloudy, uneven slivers charged with motes and neps, and broken selvedges.

It is absolutely essential that the card-clothing should be applied in such a manner that it will not slip or blister, but will present an unvarying surface of wire teeth erect and tense save for the resilience of the individual wires themselves; the crowns of the teeth under the foundation-cloth should 'bed' well upon the face of the cylinder holding the teeth rigid. This result can only be obtained by wrapping the card-clothing tightly with a given tension upon a face of metal which is absolutely true and devoid of all inaccuracies in the form of hollows; this latter question has already been treated upon in the section "Clothing preparations."

The Machine now in universal use for clothing cylinders, doffers, etc., with card filleting, is the **Patent Card Mounting Machine, No. 58, with indicating Tension Apparatus,** Fig. 15. This machine has been for many years the recognized standard medium for this work. Previous to the introduction of the card mounting machine (which, of course, since its inception, has been improved in many respects and has now attained a very high degree of perfection) the mounting of the filleting was performed manually by the card-nailer, but very little reflection will render it evident

that there must be a great deal of the rule-of-thumb method in this operation. The card-nailer never knew the amount of of tension exerted upon the filleting as there was no means of gauging it; nor could he be certain that the tension was maintained alike at all points; the work on the whole was laborious, and no matter how well performed it could not be compared with the wrapping executed by this specially-designed machine with its certitude of consistency in tension and the minimised amount of handling rendered necessary. A short description of the Patent Card Mounting Machine will assist the reader in understanding the manipulation of same. The principal features of the machine are three, viz.:—1. **The Bed** or Slide with leading screw. 2. **The Tension Head** with tension indicator; this slides on the bed and receives its motion from the leading screw. 3. **The Jack** for turning the cylinder or doffer as the case may be. The Bed is bolted on to the framing of the carding-engine in front of the organ intended to clothe. It is usual to clothe the cylinder first, and to accomplish this in the best manner the doffer may be removed thus bringing the machine and operator nearer the

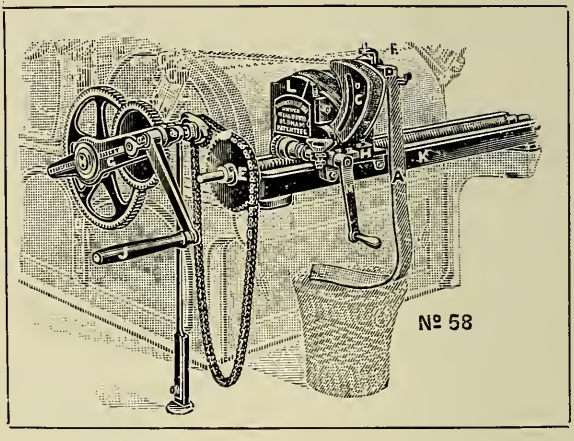



*Fig. 15.*
*Patent Card Mounting Machine, No. 58.*
*Codeword—Mounter.*

work. When clothing double roller and clearer cards the back cylinder is clothed from the back of the card ; the slow tumner, front cylinder and doffer from the front ; to clothe the tumner it will be necessary to mount a shaft or bar in the highest pair of roller-brackets of the front cylinder so as to bridge the latter.

**The Jack** is mounted on the shaft of the organ to be clothed, *i.e.*, cylinder or doffer ; it connects with the leading screw of the bed by a chain which is driven by a chain wheel on the Jack of such a pitch as will give the necessary traverse to the Tension Head according to the width of card-filleting being employed. To-day, in Cotton Cards, practically only two widths of filleting, viz. : 2 inches for cylinders and $1\frac{1}{2}$ inches for doffers, are in general use ; this being the case two chain change-wheels are mounted side by side on the Jack and all that is necessary when changing from one width to another is to pass the chain from one wheel to the other ; in this way the change-wheels are always at hand ; formerly they were loose and had the knack of being lost when required. The Patent Double-purchase Jack has been quite recently improved ; it is now so designed that it will fit all sizes of shafts without any alteration, and without the necessity of extra loose bushes, which were formerly necessary to make up the bore of the Jack when mounted upon shafts smaller than the bore-diameter of the latter.

**The Tension Head** slides along the bed receiving its motion from the leading screw fixed in the latter, which gears with the traversing wheel in the sliding platform. To bring the Head into position rapidly the wheel tightening-screw can be released and the head may be operated by the Handle shewn. The tension upon the filleting is secured in the following manner; to elucidate our description an enlarged view of the **Patent Indicating Tension Apparatus** is shewn in Fig. 16. The filleting is passed through the feed-box (D), then wound over a three-coned drum; in passing from one drum to the other the filleting is taken over curved 'shunting'-plates. The three cones are of varying diameters each being larger than the preceding one; the largest is covered with leather. From the latter cone the filleting passes over the lever (E) and goes directly to the cylinder in correct position; this lever is mounted against springs, and the tension exerted upon it by the filleting actuates the indicating needle which registers the exact amount upon the graduated arc (H).

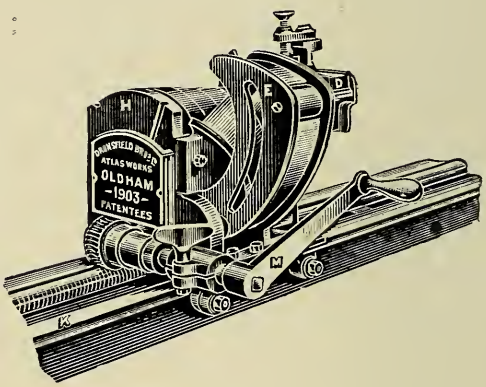



*Fig. 16.*
*Patent Indicating Tension Head, No. 59.*
*Codeword—Tension.*

The **Tension** is gained in **three distinct ways.** Firstly,—the coned pulleys create a tension of about 50-lbs. on the **back** of the fillet foundation without disturbing the

card-teeth or face of the fillet. Secondly,—by means of a hand-manipulated brake-drum on the shaft of the coned pulley the filleting is compelled to slide over the faces of the cones; this creates further "back"-tension to the extent of about 100-lbs.; thus we have, say, 150-lbs. tension exerted without disturbing the card face. Thirdly,—the remainder of the tension is gained by exerting pressure upon the face of the card-fillet; this is done by the weight-plate in the feed-box (D) actuated by a screw.

Having fixed the machine in position, now for the actual mounting. Before commencing to wrap, however, the edges of the cylinder will require to be chalked to indicate the rows of plugs and the positions of the plugs denoted on a staff; this as a guide for the nailing process after clothing. The fillet should be opened out loosely but regularly in a skip and should be allowed to stand thus for some 3 or 4 hours in the cardroom previous to clothing, in order that it may attain the corresponding temperature.

The best means of wrapping a cylinder or doffer, and that in general vogue to-day, is the so-called "inside-tail-end" system, which permits of full and unbroken selvedges with an even circle of teeth at the extreme edges of the carding organ. This method of mounting assists materially in producing an even, full-edged sliver. In the following matter we describe as clearly and concisely as possible the practical methods of attaining this result, and if carefully studied, the carder who has this work to perform will be amply repaid for his trouble.

We will suppose the Cylinder to be 50 inches diameter; filleting 2 inches wide; 8 ribs.

The Doffer to be 24 inches diameter; filleting $1\frac{1}{2}$ inches wide; 6 ribs.

Circumference of cylinder approximately 157 inches.

Circumference of doffer approximately 75 inches.

It is first necessary to obtain the length for one lap, and this is done by simply tacking the end of the fillet to a plug, and passing it once round the cylinder tightly drawn. At the point of contact chalk the card foundation and detach. This first lap is the one from which the teeth will have to be extracted to leave it of the correct shape. Figs. 17 and 18 denote the shaped tail-end laps after extraction of the teeth. The lap, as seen in the sketch, is divided in its length into sections, commencing from the chalk-mark backwards. The full width of 8 ribs is left intact for the space of 10 inches; at this point extract the rows of teeth from the eighth or last rib for a length of 18 inches,

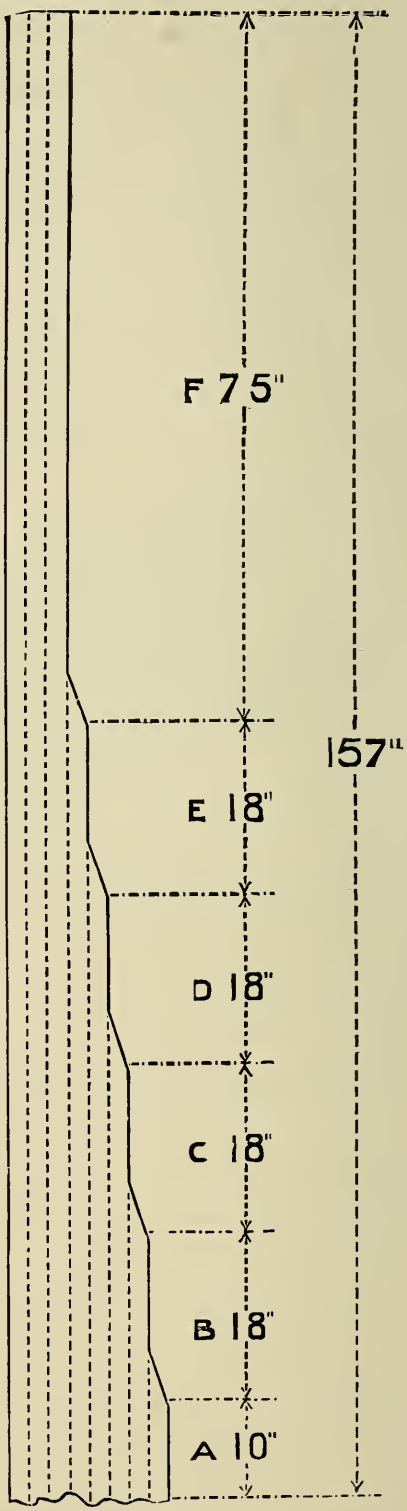



*Fig. 17.*
*Shaped Tail-end Lap for Cylinder.*

commencing with the last row then proceeding with the second row and eventually the third and last row of teeth, thus gradually reducing the width of fillet from eight to seven ribs. Repeat the extracting process in a precisely similar manner for a further 18 inches, and so on extracting from each rib until the fourth rib is reached. The fourth rib is treated the same way up to the end of the filleting.

Fig. 19 depicts the Rib Setting

Fig. 20 explains the method of the gradual extraction of the teeth ; the sketch depicts one full rib, and one rib with two rows extracted.

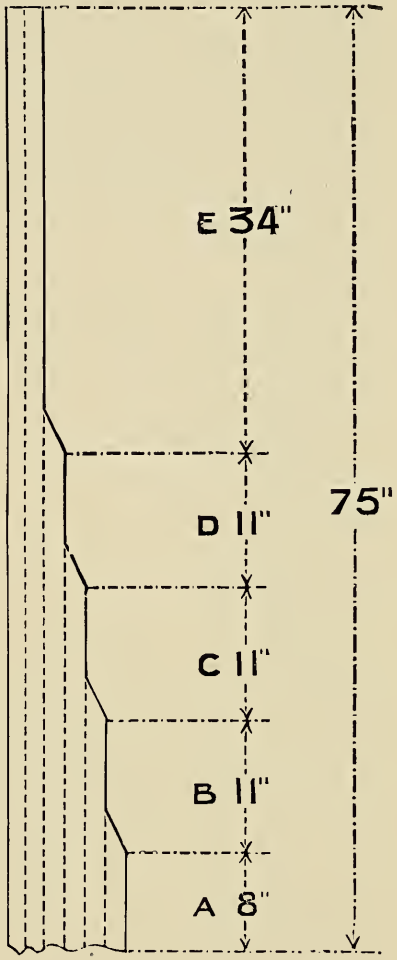



*Fig 18.*

*Shaped Tail-end Lap for Doffer.*

We have now the following result. Fig. 17 (cylinder tail-end) :—

| | | | | | | |
|---|---|---|---|---|---|---|
| From end for space of | 10 inches, | 8 ribs full width allowed for stretch. | | | | A |
| ,, 8th rib to | 7th rib | 18 | ,, | (8th rib extracted) | | B |
| ,, 7th ,, | 6th ,, | 18 | ,, | (7th ,, ,, | ) | C |
| ,, 6th ,, | 5th ,, | 18 | ,, | (6th ,, ,, | ) | D |
| ,, 5th ,, | 4th ,, | 18 | ,, | (5th ,, ,, | ) | E |
| ,, 4th ,, | 3rd ,, | 75 | ,, | (4th ,, ,, | 3 ribs left) | F |

Total length of lap, 157 inches = circumference of cylinder.

Thus shaped the filleting starts with a width of 3 ribs and gradually widens to the full 8 ribs. At this point the filleting, having made one complete circuit round the cylinder will have to be cut and fitted so that in continuing its course it will not overlap the 3-ribbed commencing end; this is hereafter explained.

The doffer would have the following dimensions, Fig. 18 :—

| | | | | | | |
|---|---|---|---|---|---|---|
| From end for space of 8 inches, 6 ribs allowed for stretch. | | | | | | A |
| ,, | 6th rib to 5th rib | 11 | ,, | (6th rib extracted) | | B |
| ,, | 5th ,, 4th ,, | 11 | ,, | (5th ,, ,, ) | | C |
| ,, | 4th ,, 3rd ,, | 11 | ,, | (4th ,, ,, ) | | D |
| ,, | 3rd ,, 2nd ,, | 34 | ,, | (3rd ,, ,, | 2 ribs left) | E |

Total length of lap, 75 inches = circumference of doffer.

Having cut the tail-end as described, the next thing is to commence wrapping. Take the cylinder first. First of all find a suitable plug (preferably the nearest to cylinder-edge) and fasten the 3-ribbed tail-piece with two tacks (Fig. 21), wrap on until 4-ribbed width is attained; as soon as the narrow tail-piece lies on the cylinder surface put tension of 300-lbs. upon the filleting, but this gradually and gently; now tack the narrow tail-end in two plugs and continue wrapping until the commencing point is reached. With the tension well up, secure the fillet with a double-tacking cross-ways. Having thus secured the first lap, relieve the tension and put a few more tacks in the narrow end to ease the strain. Preparations are now made to 'fit' the filleting which is to form the second or dove-tail lap, as follows :—From the point (A) (Fig. 22) measure off

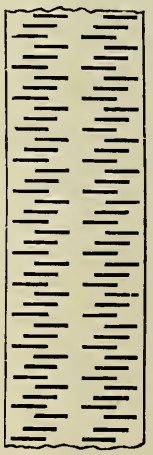


*Fig. 19.*
*Rib Setting.*

18 inches and extract the teeth from the third rib of this portion, gradually tapering at the end into the second rib; now measure off a further 18 inches and extract the teeth from the second rib tapering into the first rib; now measure off a further 18 inches and extract the first rib to the point where it will attain the full width of 8 ribs. We thus make a triangular-shaped piece from which the teeth have been extracted on the outer edge, but the foundation must not be cut away until the joint has been made at point (A), which is accomplished as follows :—Put 350-lbs. (doffers 230-lbs.) tension upon the fillet and insert two tacks into the upper half of the plug, as shewn. This done, and the fillet well held, the triangular piece of foundation may be carefully cut away from the joint as far as the point where the filleting attains its full width. Now continue winding at this tension right across the cylinder until the right-hand edge is nearly reached, say about $1\frac{1}{2}$ inches from the edge; tack the fillet securely and take off the tension. Then, wind the fillet on by hand to the point where it touches the edge of the cylinder, at which point of contact mark the fillet with chalk; two or three inches above this point extract the teeth from the 6th, 7th, and 8th ribs, thus forming the basis from which to work in extracting the teeth exactly

*Fig. 20.*
*Teeth Extraction.*

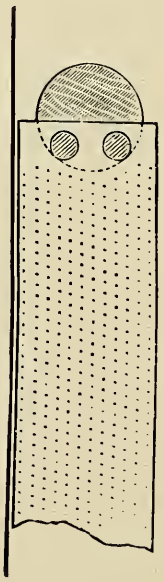


*Fig. 21.*
*Tail-end Fastening.*

as previously done at the other end, but the reverse way. The finishing end is thus shaped and fitted in all round the circumference of the cylinder resulting in a full unbroken edge, and commonly called,—the "inside tail-end," generally reputed to be the best means of mounting card-fillet. The cylinder should now be allowed to stand a little while to permit the filleting to adjust itself upon the cylinder-surface ; then same may be tacked all across and all around the cylinder in all the plugs.

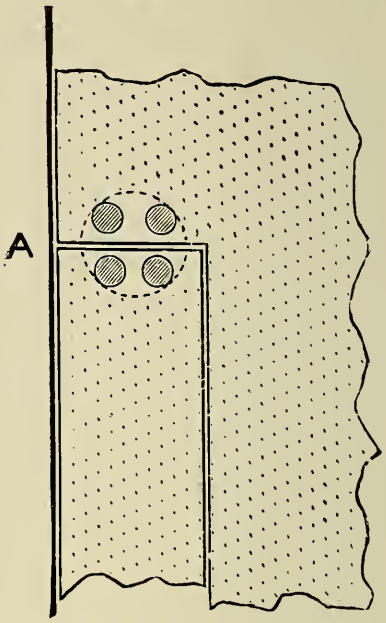



*Fig. 22.*
*First Lap Joint.*

N.B.—In the foregoing description of the method of mounting card-filleting upon the Cylinder, we have taken as a basis a 3-rib tail-end, but there is no hard and fast rule ; some prefer to commence with 4 ribs, the spaces varying accordingly. In general outline the description is sufficient to guide the operator in handling fillets of all settings.

# Card Mounting.

## 2. Revolving Flats.

THE clothing or mounting of Revolving Flats is a matter which requires very great care, and the manner in which this is performed will have a great effect upon the working of the card for all time, determining the quality of the sliver so long as the clothing remains on the flats.

The method of mounting card-tops upon the iron flats has been entirely changed since the introduction of this type of carding engine. In the early days the 'tops' (as they are termed, unmounted), were all attached to the flats with lead rivets ; holes were punched along the edges of the cloth, the rivets passed through the holes and through corresponding holes which were drilled in the flats ; the rivet heads were then expanded with special pincers. We made many machines for putting the 'tops' on by this method, but the rivetting system is now obsolete. All flats to-day are attached by means of "Clips." The Clip is in the form of a narrow steel strip having one of its edges serrated and bent over ; this serrated edge is forced into the cloth foundation of the flat top. Fig. 23 illustrates a 'top' with the clip inserted in both edges. Where the flats are re-clothed at the mill, in cases where the card-works and machine-works are far removed, the tops are sent to the mill in this form. We would point out here that this type of clip, viz. :— the "Deiss" pattern is only one of several, but all, save one, are alike in respect to their method of clinching the iron flat, and this description applies to all these types. There is one type of clip which is different to the others in that the plain steel strip possessed by all the others and which is intended to bind round the edge of the flat, is replaced by a spiked strip, the spikes being so spaced as to penetrate the holes in the flat edges ; this applies naturally to the old drilled flats adapted formerly for rivets, but even in this case the machine we are about to describe is applicable.

*Fig. 23.*
*'Top' with clips attached.*

All of these clips possess some little peculiarity different from each other, but all aim at obtaining the same result, viz. :— the stretching and holding of the card-top upon the iron flat without permitting any possibility of the same slipping and causing 'blistering' with its attendant ills in the form of spongy surface and loose wires.

A machine for clipping top-flats satisfactorily should be capable of doing the work without necessitating a skilled operative, inasmuch as the work is done, perforce, in mills far removed from the card-maker and by the regular operatives ; it should be simple but positive in its action. The perfectly-mounted top-flats should not be too tight or the angle of the wire will be distorted and the pierced holes in the foundation-cloth through which the wire teeth pass will be opened and the teeth loosely held in consequence ; nor should the top be loosely mounted, as in this case a spongy surface will result and the crowns of the wire will not bed properly on to the iron face of the flat.

The Machine now in great demand for this work is the **Patent Flat Clipping Machine No. 30, Fig. 24,** by means of which flat-tops may be easily and quickly mounted upon the iron flats at the mill thus saving the heavy cost of carriage to and from the card-works, risk of breakage, and time, which means production. This machine is capable of mounting all makes, all widths, and all lengths of flats. The method of working it is described as follows :—

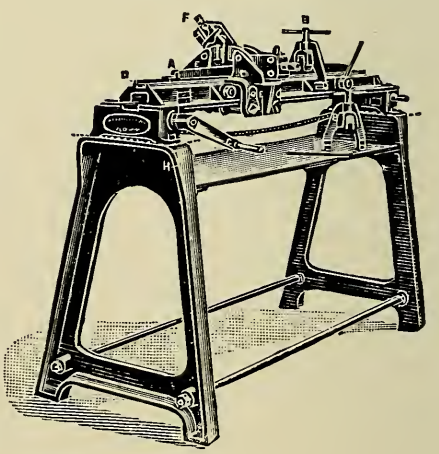


*Fig. 24.*
*Patent Flat Clipping Machine No. 30.*
*Codeword—Clipper.*

The card-top with its clips attached (as seen in Fig. 23), is placed by hand upon the iron flat and then inserted, card-face downwards, in the trough of the bed ; one side of the trough is adjustable to permit of various widths being mounted ; the adjustment is controlled by three screws. The card-top has now to be well bedded on to

the flat-face, and to accomplish this two movable cramps are supplied with the machine; these cramps, of which one is shewn in position, are placed over the flat and exert pressure upon the same, forcing the flat well home and leaving the clips upstanding on both sides of the flat; it may be mentioned that in addition to bedding the top down to the flat-face, the foundation-cloth receives the necessary amount of lateral stretch at the same time; this is accomplished in a simple fashion by the trough itself, the beads of which carrying the flat clips being designed in such a manner as to allow the foundation-cloth to expand in ratio with the pressure exerted by the cramps upon the flat. Whilst the cramps are in position the bed is tightened up by the three screws to bind the clips to the edges of the flat. The cramps are then removed; these are so constructed as to permit of instantaneous attachment and detachment. The clips are now ready for the bending process and this is performed by bowls, one on each side, each set and adjusted in its own head; the heads are traversed simultaneously by turning the handle of the chain-drive. The heads carrying the bowls are so designed that they may be moved upon their pivots to present their bowls at different angles to the flat-edge; this arrangement permits of a gradual folding-over of the clip as shewn in Fig. 25 without loss of time in multiple setting. The bowls, when first set up to the flat-edge, bend the clip over from the straight (1) to position 2; then the heads are pushed up to the next angle (where they are held in position by a pawl) and the next rolling will bend the clips to 3; then the finishing roll to 4. Fig. 26 depicts the actual rolling with the bowls set to position 4. Not all flats possess the same section, but this has been foreseen and by means of differently shaped bowls, **all** makes of flats can be dealt with.

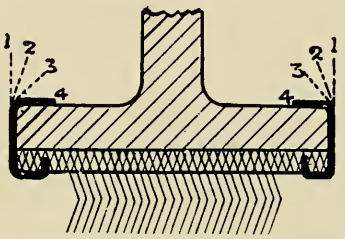



*Fig. 25.*
*"Gradual Clip-bending."*

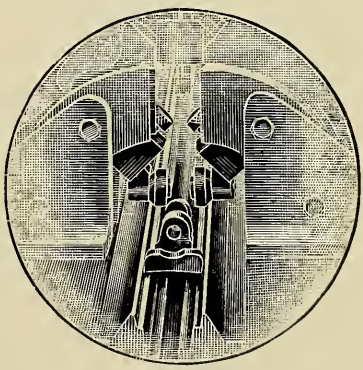


*Fig 26.*

# Card Mounting.

## 3. Woollen Swifts and Doffers.—Sheets.

THE nailing of Card-Sheets on Swifts, Doffers, and other organs of the woollen or cotton-waste card has always been and is yet somewhat primitive compared with the fillet-system already described; the absence of continuity and the multiplicity of separate small sheets make the work of sheet-nailing 'choppy,' and it must perforce be left to the carder or card-nailer to do the work manually to the best of his ability. The same remarks apply to the clothing with sheets as to the clothing with fillets, with reference to the essential features in general, *i.e.*, they must be stretched and nailed quite tight, and well bedded, so that there will be no liability to blister or slip on the face of the metal.

Sheet-nailing is not a difficult operation provided that ordinary due care is exercised and routine strictly followed. The special implements required for the work are simple, consisting of a **Card Sheet-Nailing Ratchet No. 130,** as illustrated in Fig. 27. This apparatus is mounted on a square shaft, slotted at each end so that it may be bolted in position either on the framing of the carding-machine, or in a pair of convenient worker brackets. A leather strap, or thong, is passed through the eyes of the pincers (A) and over the fulcrum stud (B).

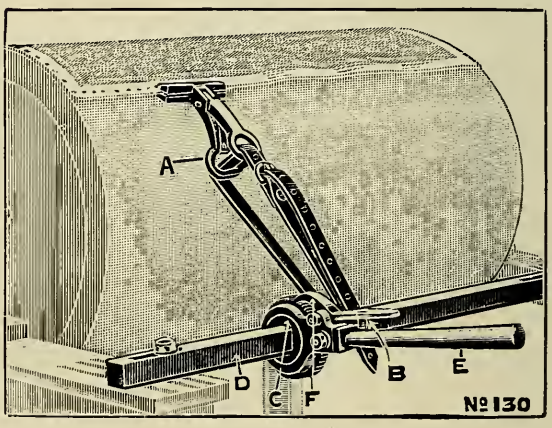



*Fig. 27.*
*Card Sheet-Nailing Ratchet No. 130.*
*Codeword—Ratchet.*

When clothing wood swifts, doffers, or rollers, it is necessary, before commencing nailing, to strike a horizontal chalk-line across the cylinder; this can be done accurately with the aid of the truing-up slide. Iron cylinders, of course, are ready plugged and do not necessitate this.

Sheets are stretched only in one direction, viz. :—downwards, never transversely, as this would be liable to open the holes through which the card-teeth pass, thus causing loose wires. It will be noted that card-sheets have a margin, usually $\frac{1}{2}$-inch round the two sides and at the top, with a rather wider margin at the bottom, to allow for the grip of the pincers in stretching. The sheet is first placed in position by tacking the upper margin at each end, then the whole width of this margin is tacked at intervals of about half-an-inch Now comes the stretching operation and the nailing of the bottom side, or lower margin. The ratchet (C) (Fig. 27) is slidden along the bar (D) into position at the left-hand side of the sheet, and the pincers are allowed to grip the margin ($4\frac{1}{2}$-inches is the usual width of the pincers); then, by depressing the ratchet-lever (E), the sheet is stretched downwards; the ratchet is held by the pawl (F) whilst the operator nails this portion of the sheet, having both hands free. This operation is repeated right across the cylinder, the ratchet-motion and pincers being advanced $4\frac{1}{2}$-inches at a time. When the whole width is completed the superfluous margin is trimmed off in a perfectly straight line so that the adjoining sheet will fit flush to it.

# Card Mounting.

## 4. Card Rollers.

**(Rollers and Clearers; Workers and Strippers); (Stripping and Burnishing Rollers; Raising Rollers, &c.)**

WHILST accurate clothing of cylinders and doffers is a *'sine qua non'* to good carding, it is nevertheless essential that their working companions, viz. :—the Rollers and Clearers of cotton cards, and the Workers and Strippers of woollen and worsted cards, should be treated in a similar manner. All that has been advanced in respect to the drawbacks of loose card-clothing and irregular surfaces is just as true in the case of these organs, and care should be exercised to produce the very best results obtainable.

Good carding can only result from parallelism of the carding surfaces, and this can only be obtained by eliminating all possibility of blistering or slipping of the card-clothing upon each and all of the carding organs, as any one of them possessing such defect will cause a deterioration in the quality of the carding through 'rubbing' of the surfaces of points. For the process of wrapping, the smaller card-rollers, with which we are now dealing, are dismounted from the carding-engine and are taken to the **Card-Roller Mounting Frame No. 61, Fig. 28.**

This machine is a combined apparatus and is a very useful machine to have in the mill, serving many purposes. As illustrated, it is shewn allied with the card-mounting machine bed and the tension head which are mounted on the frame-sides and geared up with the turning-wheel by means of a chain. The chain-wheel on the screw-end determines the traversing speed of the tension-head which carries the card filleting, each width of filleting demanding a separate change wheel.

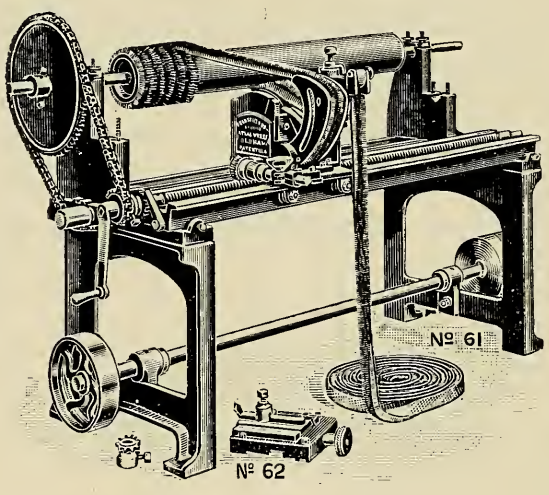



*Fig. 28.*
*Card Roller-Mounting Frame No. 61.*
*Codeword—Lapper.*

With this machine, fillet-covered rollers of all types may be clothed with a positive tension, viz. :-Rollers and clearers, workers and strippers, stripping and burnishing rollers used on cotton cards, the raising-rollers of wire napping or raising machines, cloth cropping machines, etc., etc The frame is also useful for covering grinding rollers with emery filleting. It is also adapted for turning-up wood rollers ; we have already treated upon this in a previous page.

The roller, having been duly prepared for wrapping, *i.e.*, the old filleting stripped off, all old tacks cleared and the roller-barrel made true, it is placed in the upper steps as shewn and the large chain-wheel screwed on the shaft ; the change chain wheel in accord with the width of the fillet in use.—$\frac{3}{4}''$, $1''$, $1\frac{1}{2}''$ as the case may be, is then placed on the screw-shaft of the card-mounter bed and the handle attached thereto. The tension-head is next placed at the left-hand in position to commence wrapping ; the head is traversed by its own handle when setting in position and when required to return quickly to starting point, but whilst mounting it receives its motion from the screw. The filleting is now passed through the card-trough and over the cones of the tension-head ; the end of the fillet is picked to taper and tacked securely to the roller. Tension is next put on the fillet as explained on pages 34/35, and the operator commences to wind ; by means of the gearing, the tension-head will traverse proportionately with the rotation

of the roller, laying the filleting lap by lap until the end is reached. Now nail the second lap from the end whilst the tail end is tapered and then finish off. It has been found more satisfactory to nail every lap instead of every alternate one, as was formerly the general custom ; the tacks should be inserted in every other lap on **both** sides of the roller ; with plugged iron rollers, one is naturally guided by the plugs.

The tensions recommended are as follows :—For rollers and clearers, workers and strippers, $1\frac{1}{2}''$ hardened and tempered steel wire, 200-lbs. ; mild wire, 140-lbs. ; 1″ h and t wire, 130-lbs.; mild wire, 90-lbs. For stripping and burnishing rollers, 1″ filleting, either hardened or mild, 70-lbs. It will be observed that the "back" tension exerted by the tension head, and explained on page 35 amounts in the aggregate to about 150-lbs., so that in most cases there will be no need to resort to pressure upon the card-teeth in the feed-box.

# Card Mounting.

## 5. The Licker-in. Feed Rollers, &c.

MOST Lickers-in are now covered with the inserted saw-tooth wire known to the trade as 'Garnett' wire. There are some lickers-in which are still clothed with filleting set with saw teeth ; these latter may be clothed with the aid of the card-mounting machine on the card-roller mounting frame which formed the subject of the last article.

The inserted saw-tooth wire is laid in grooves which are cut in the surface of the licker-in barrel ; the inserting operation is one which requires considerable care, and previous to the invention of the apparatus we are about to deal with, skill ; if the spinner should not possess the right kind of appliance for the work, it would be advisable to obtain the same rather than run the risk of incalculable damage through bad mounting. The majority make use of an ordinary lathe fitted with a somewhat primitive attachment in the shape of a platform which takes the place of the tool-rest and upon which are mounted guide-jaws ; the wire, in this case, is fed from a bobbin mounted over the lathe which traverses simultaneously with the platform. When one has, perforce, to use the only means at command, he naturally makes the best of it ; and the system described was in general vogue until the advent of the machine illustrated herewith. The **Patent Licker-in Wire Mounting Machine, No. 93a, Fig. 29,** is specially designed for clothing lickers-in of all ordinary cotton cards. The machine is also convertible into a grinding and dressing machine (see article page 82). Dealing with the wire-mounting properties of the machine, it consists of a frame fitted with a slide on which slides the mounting-head ; placed at the left hand, standing on the floor independently, is a windlass (G) on which is carried the roll of wire ; to complete, the Jack (A) which is operated by hand, is screwed

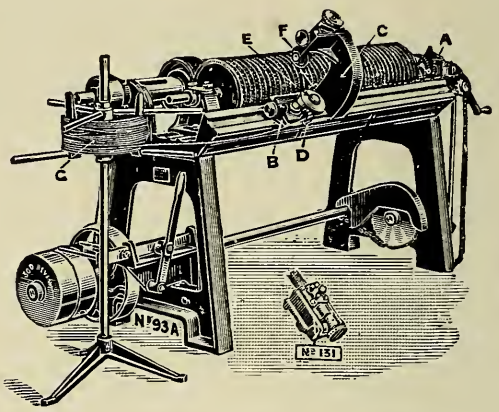



*Fig. 29.*
*Patent Licker-in Wire-Mounting Machine, No. 93a.*
*Codeword—Sawmount.*

on the licker-in shaft. Lickers-in, etc., are usually grooved to 1″ pitch, the number of grooves per inch varying from 6 to 12 per inch; in the cotton card, the variation is from 6 to 8 lines per inch. The gearing of the Jack is calculated to traverse the mounting-head one inch for every revolution of the licker-in, the head receiving its momentum through the chain attachment.

The process of mounting the wire upon lickers-in with this machine is very simple and effective, the wire being well caulked. The method is as follows:—The wire is led from the windlass to the mounting-head through a pair of jaws (D) which straighten out any kinks and at the same time put tension upon it; thence, the wire passes round a carrier-pulley, through guide-studs and under the caulking-bowl (F) to the groove in the roller. The end is then caulked into the groove with a punch, by hand; by the way, it is as well to solder all caulked ends to prevent any possibility of them flying out during work.

The mounting-head possesses three separate settings, viz.:—1. Centric setting to ensure the wire being led directly into the groove. 2. Tangential setting to present the caulking bowl at the correct angle to correspond with the pitch. 3. Pressure screw for the caulking bowl. Having set the head at these points, the whole necessitating only a few minutes of time, the licker-in is put in motion, and the wire is

mechanically fed into the groove and caulked simultaneously from one end to the other. The same procedure is followed with each succeeding groove until the roller is completely covered.

After covering, the roller should be ground to render the surface of teeth perfectly parallel and cylindrical ; this may be done on the same machine with the aid of the grinder which is attached to it (See fig. 44.)

The machine illustrated in Fig. 29 will take, as stated, all Licker-in rollers of ordinary Cotton Cards, from 8 inches to 10 inches diameters. Since the introduction of this machine, it has been found necessary to design a machine for the rollers of woollen and worsted cards, garnetting machines and so forth ; these rollers, from feed to lickers-in, possess great variation in diameters. In order to meet all demands, a New Licker-in Mounting, Grinding and Dressing Machine No. 132a has been designed to accommodate rollers from $2\frac{1}{2}''$ to 30″ diameters. This machine is **power driven** owing to the heavy work demanded in handling such large diameters.

# Part III.

# The Grinding of Cards in the Mill.

## Abrasives, and their relation to Card-Grinding.

**Emery the best.** The abrasives in use for grinding purposes are many and various, but in dealing with the grinding of card-clothing the keenest abrasive is by no means the best. This is the reason why so many uninformed people have gone astray by attempting to exploit various materials and mixtures of abrasives for doing the work of grinding quickly. The Grinding of Cards is a matter demanding other qualities than keenness of abrasion in the grinding medium. Whatever material is used it must not be too hard, nor yet too soft ; it must, further, not fill up rapidly and become smooth. Emery, Corundum, Flint, Carborundum, and other materials have been used in turn by way of experiment but all have led to the same conclusion, viz :—**Emery** is the best card-grinding agent, taking everything into consideration, and has been established as the standard medium.

**Emery grain construction.** There are, however, different classes of emery ; all are not of equal utility for this especial purpose. The best emery is of angular or pyramidical form ; round or flat emery is of little use. If a grain of emery be magnified, say, 10 or 12 diameters, it will present to the eye a cellular formation ; round the cells are very minute, needle-like points, and it is to these points that the whole of the grinding power of emery may be attributed so far as their effect in the grinding of cards is concerned.

**Hardness not a 'sine qua non.'** Other substances do not possess this peculiarity, and by reason of this are not so suited for the work. Take Carborundum for instance. Carborundum is an excellent medium and has established itself as one of the very best agents for grinding plain metal surfaces, on account of its hardness and keenness, but by the very reason of these attributes it becomes at once *ill-adapted for card-grinding*. The steel wire points of card-clothing demand special treatment; apart from the truing-up process attained by grinding, the points must be so ground and left that the surface will be covered with a series of minute scores which serve to hold and carry the fibres in the carding process. Carborundum cuts too keenly and too cleanly, and whereas it might succeed in grinding the metal away in less time, it leaves the points too clean-cut, so clean, in fact, that they do not hold and carry the fibres to advantage. Carborundum and Emery may be, in their general construction, likened to coal and coke respectively; the former is hard and possesses clean-cut faces and edges; the latter much resembles emery in its general formation.

**When emery is worn.** As already stated, the whole of the grinding power contained in the emery grain is accounted for by the minute eruptions upon the surface, resembling a crater-like formation. When the sharp points of these eruptions are worn off or struck away by contact with the card-teeth, and the grains assume a polished effect, the emery is no longer capable of doing its work to advantage, and it is better, and in the end cheaper, to replace it with new.

**False economy.** It is false economy to attempt to run the grinding substance any longer than its capacity to do good work will allow; it is far cheaper to replace the emery

frequently than to let it run too long ; in the latter case, the card-clothing and the quality of the carding both suffer to an infinitely greater degree than the so-called economy exercised can compensate. The emery may appear good to the eye, and for ordinary uses as an abrasive other than card-grinding it will undoubtedly still retain much of its usefulness, but we repeat that for card-grinding **smooth emery is useless,** nay, worse than useless, it is harmful and we do not say this without practical reasons.

**Worn emery causes damage.** When emery is new and the grains are replete with sharp, clean, abrading surfaces, the contact with the card points produces instantly a sharp, hissing sound, and this facility to render audible the abrasive contact makes it an easy matter for the grinding operative to establish the right amount of 'cut' in setting his grinders. The emery, when worn, having lost the keen, abrading properties in the shape of the minute surface-points which are all that is useful for the purpose of grinding cards, on the contrary, does not respond to the contact so readily, and as the operator has only his hearing to guide him in grinder-setting, there is always a danger of the grinder being set too deep, causing buckling of the wire, hooked points, broken-out teeth, and other defects ; particularly in top-flats may this damage be recognized.

# A Little History.

## Hand Strickling.

EMERY having become universally adopted for the purpose of grinding cards, it may be interesting to trace the development of its use and adoption. In the old days, when the Roller and Clearer Card was the only known type, clothed with mild steel or iron wire, *i.e.*, previous to the invention of hardened and tempered steel, the grinding instruments were of a primitive character. In the very early stages, the unique grinding instrument was the Hand-Strickle, of which two types were in vogue, the Wood Strickle, Fig. 30, and the Cloth Strickle, Fig 31. The Wood Strickle consists of a piece of pine-wood 18″ long × 3″wide with fluted edges for the finger-grip, and covered on both sides with grain emery. The Cloth-Strickle is in the form of a linen sheet 18″ long × 14″ wide, covered with grain emery all over one side, save for margin top and bottom. This type of strickle is nailed through the margin on a frame, a simple form of iron frame at each end of which are fixed wood ribs for nailing. These, as stated, were the first grinding implements, and there are carders living to-day who have cause to remember the time when they were compelled to stand over the cards all the time when grinding with these hand strickles, and inhaling the resultant dust for hours at a

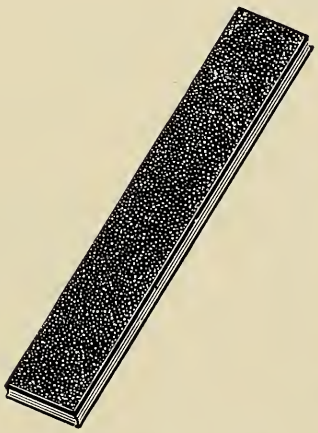


*Fig. 30. Wood-Strickle.*
*Codeword—Woodhand.*

*Fig. 31. Cloth-Strickle.*
*Codeword—Clothand.*

stretch. In these days of compulsory hygienic conditions, it is difficult for the modern carder to imagine the state of things as then pertained.

**The first Grinding Roller.** Following on the strickle, but assisted by the strickle periodically to secure a better point, came the full-length grinding roller. This had to be light in weight, albeit strong and true, owing to the prevalence of double cards, *i.e.*, cards possessing two cylinders, a slow tumner, and doffer, the grinding of some of these organs necessitating the lifting and placing of the grinding roller in position by one man ; the man was obliged to lift the roller end up and allow it to fall gradually into the hands of his fellow-operative on the far side of the card ; weight in the roller was an item to be considered, in view of the possibility of the roller, by reason of its weight, overcoming the operative and dropping upon the card-clothing. To meet this demand, we constructed the Patent **Light Grinding Roller NO. 114,** which as shewn in Fig. 32, consisted of tin sheets mounted upon numerous internal tin discs. A true surface was obtained by covering the barrel with grain-emery fixed thereto with a special mixture. A traversing motion was added to give a reciprocal movement to the roller, thus equalizing the abrasion and grinding a little upon the sides of the teeth.

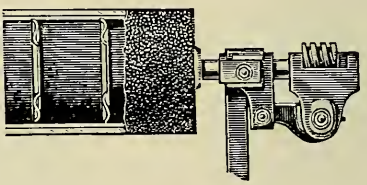


*Fig. 32.*
*Light Grinding Roller, No. 114.*
*Codeword—Lightroll.*

**Mechanical Strickling.** Although the Roller very materially helped in the process of grinding, the carder of that day favoured the results obtained by the Hand Strickle, and to attain the desired point always finished off by grinding with the same, either cloth or wood. There was much to attribute to this preference, as an expert grinder could manipulate the

hand-strickle with a gentle side to side movement to a nicety, resulting in a point not to be equalled by the hard and fast roller-grinding. This preference for the strickle led us to study the question of mechanical strickling, which would do away with the laborious and unhealthy hand-labour, and we were rewarded by the discovery of the **Self-Acting Strickle-Grinder, No. 118,** Fig. 33, which we placed on the market and which became rapidly adopted. The self-acting strickle-grinder consisted of a double threaded screw, which carried, attached to it by a guide pin, a traversing saddle. Fixed to the saddle are two arms, each arm carrying a strickle, one for the cylinder and one for the doffer (or back cylinder and tumner), both of which were ground simultaneously. The drawback of mechanical strickling, however, was in the flexibility of the strickles, which permitted them to rise and fall with the inequalities of the card-surface, but we have the self-acting strickle-grinder to thank, as being the forerunner of the Traverse-Wheel Grinder, which is now in universal use and which forms the topic of our next article.

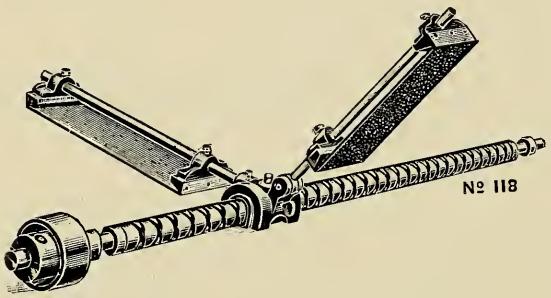



*Fig. 33.*
*Self-acting Strickle-Grinder No. 118.*
*Codeword—Strickler.*

# The Grinding of Cards in the Mill.

## 1. Cylinders and Doffers.

THE Cylinders and Doffers of modern cotton cards are almost invariably ground with the Patent **Traverse Wheel Grinder, No. 120, fitted with patent Differential Motion,** Figs. 34 and 35. The Traverse Wheel Grinder consists of a steel tube 3 inches diameter (or more, according to length), containing an internal double-way screw, one end

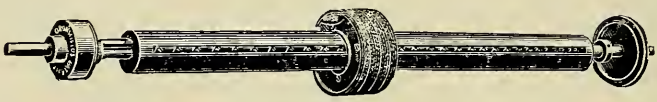


*Fig. 31.*
*Patent Traverse-wheel Grinder No. 120, with Patent Differential Motion.*
*Codeword—Travwheel.*

of which projects through the tube, the other end pivoted in the tube-end to which the driving shaft is fixed. Upon the tube and connected through the tube-slot with the internal screw, is mounted the grinding wheel, or traverse-wheel, from which the apparatus takes its title.

Thus, by rotating the tube by a pulley mounted on the fast or driving end, the grinding wheel is rotated, and by rotating the screw from its own shaft which projects through the tube at the other extremity the grinding wheel is traversed from end to end, the direction of traverse alternating as the guide-fork reaches the reversing ends of the screw-thread.

**The Differential Motion.** Formerly, two separate and distinct drives were necessary, one pulley being required to drive the tube to give the rotation, and another to drive the screw to produce the traversing movement, but at the present time nearly all these grinders are demanded with our **Patent Differential Motion, No. 115, Fig. 36,** attached;

## DRONSFIELD'S PATENT

# Traverse Wheel Grinder No. 120.

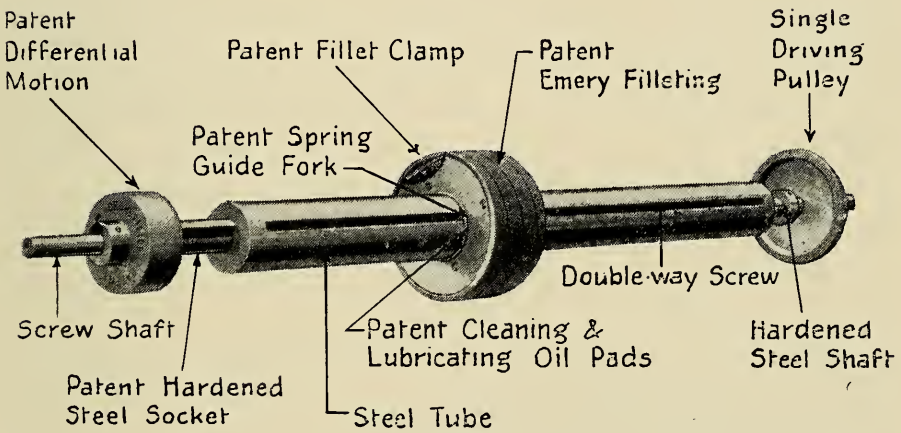



**Fig. 35.**

**Detailed inventions and improvements.**

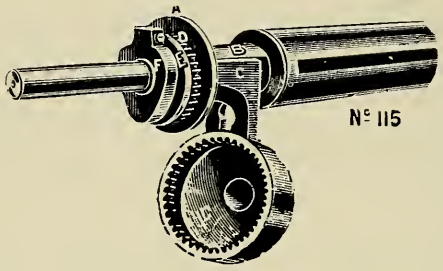



*Fig. 36.*
*Patent Differential Motion No. 115.*
*Codeword—Transmit.*

this dispenses with the screw-driving pulley and gives a sweet and silent traverse in unison with the speed of revolution. The Differential Motion supplied for grinding cylinders and doffers has a pinion of 35 teeth gearing with the internal gear-box containing 40 teeth ; the pinion receives its motion from the socketed end of the tube, upon which the whole of the motion is mounted save the gear-box ; the latter is fixed to the screw shaft ; thus the screw receives its rotation through the motion from the tube at the reduced speed of 40/35, or in other words one revolution in every eight ; this reduction in speed causes the grinding wheel to traverse. The gears of the differential motion may be altered to give any desired speed (within limits) of traverse to the grinding wheel, but the 35/40 gear has given such universal satisfaction for grinding cylinders and doffers that we have made it the standard ; the motion thus geared gives about 150 inches of traverse per minute, running at 750 revolutions, this being equivalent to about three traverses across the card. The adoption of the differential motion certifies the correct traversing speed in ratio with the rotary speed, and, in dispensing with the need for a separate pulley-drive for the screw, negatives the risk of damage to the card by removing the second driving band which was a frequent cause of accidents.

**The Best Type of Grinder?** The question is often asked, "Which is the best type of grinder for Cylinders

and Doffers ? " We reply without hesitation,—the Traverse Wheel Grinder. We give this reply for several reasons :—

1st.—The Traverse Wheel Grinder produces a truer surface of card-teeth than any other instrument.

2nd.—Better points result from this type of grinder.

3rd.—It grinds less wire away in the attainment of these results.

4th.—Less time is necessary for the completion of a good, sharp, carding point.

We will explain in the following pages how these results are obtained.

## The two principal grinding instruments.

As reviewed in the previous pages, it will have been remarked that the grinding instruments for the purpose of grinding card-clothing in textile factories have been of various types, but to-day it may be safely asserted that there are but two types in general use, viz. :—**The Traverse Wheel Grinder,** and the **Long Grinding Roller,** Fig. 37 ; with these two types we have to deal.

The Traverse Wheel Grinder has, without doubt, ousted all the types as a **finisher** generally, and in the preponderating majority has eliminated all other mediums as the one and only grinder for use on cylinders and doffers.

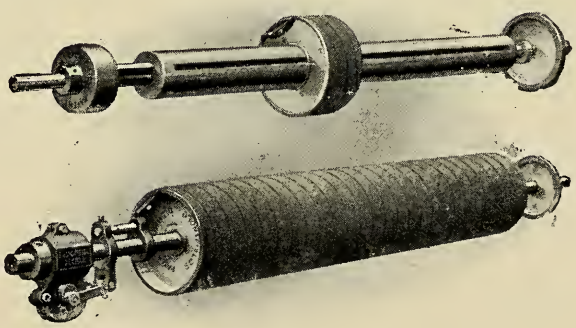


*Fig. 37.*
*The Modern Card-Grinders.*

A few, very few, still use the long, full-bodied grinding roller solely.

A few more use the long grinding roller to grind down the high irregularities preparatory to finishing with the traverse wheel grinder.

The large majority use the traverse wheel grinder 'in toto.'

**Uses of Long Roller.** The long Grinding Roller must not, however, be condemned. It has its uses. Properly made, it is a most useful instrument for spinners of coarse and low-medium counts where the nature of the fibre is very harsh upon the card-wire, upon waste cards and the like. It is also useful upon roller and clearer cards, where it is necessary for the grinding instrument to raise the dust from the wire-foundation and for 'facing-up' with the full body of emery in contact with the full width of the card-surface ; but in the long run it pays to finish off with the traverse wheel grinder.

**"Truth;" Traverse Wheel v. Long Roller.** Now, with regard to the first claim we make for the traverse wheel grinder, viz. :—"**Truth.**" In comparing the two grinding instruments—the Traverse Wheel Grinder and the Long Grinding Roller—we must take into consideration the primary condition of each. As we make them, both are perfect examples of the mechanic's art ; both possess steel barrels or tubes, which have been ground with the utmost precision ; both are covered with emery or filleting to a surface of guaranteed truth ; both are balanced so that they may be run at very high speeds without vibration ; they are tested at speeds far in excess of any card-grinding practice. Where, then, is the difference in practice in the results attained ? The reason is explained as follows :—

**The Long Grinding Roller** covers the full width of card-surface ; the emery-covered surface, which admitted, is perfectly true when new, is called upon to true up an irregular face of card-clothing, say a **hollow cylinder.** The result of this uneven contact during grinding will have its effect naturally upon the emery surface, so that very shortly

after the roller is put into operation it will no longer be true but, rather, full in the centre through the keener abrasion at the ends. In other words, the emery surface, which is a wearable commodity, is used up in ratio with the irregularity of the card-covered surface. With the **Traverse Wheel Grinder** this uneven wear does not obtain. The grinding wheel or disc, usually only $3\frac{1}{2}$ inches wide, slides along a true steel tube and grinds off the irregularities as it comes into contact with them in its traverse. **The same emery touches every portion of the wire** so that the result is a **true line of teeth,** a prototype of the tube upon which the disc travels.

**Point.** It is computed that the side-deflection of card teeth when depressed by the emery contact, *i.e.*, when the emery is set into the wire at the correct grinding depth, is about 9°. The accompanying illustrations, Figs. 38 and 39 depict this alternate deflection of the teeth by the grinding

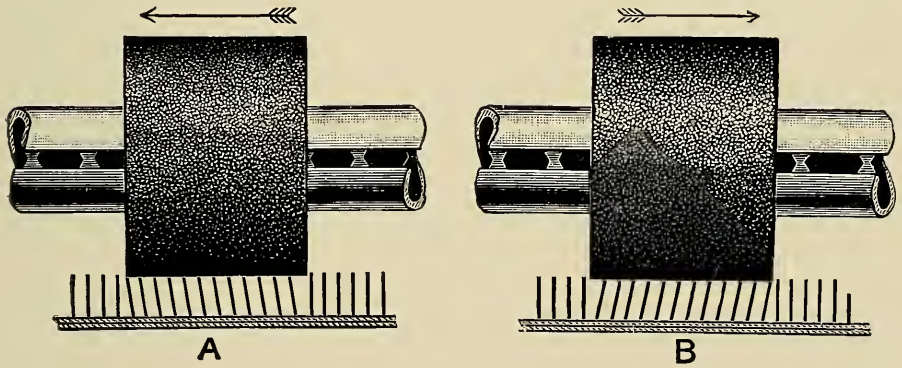



*Fig. 38.* *Fig. 39.*

*Depicting clean "Side-brushing" action with Traverse Wheel Grinder.*

wheel of the traverse-wheel grinder, in its alternating passage across the cylinder or doffer. As shewn in Fig. 38 the teeth are all deflected one way by the grinding disc as soon as the latter comes into contact ; directly the disc has passed, the teeth regain their normal upright position ; Fig. 39 shews the result of the return passage of the disc. In this way the lateral action of the grinding disc is more or less of a '**brushing**'

**action,** each side of the wire being alternately pushed over, gently abraded, and allowed to regain its normal position ; the forward rotary action of the disc grinds somewhat from 'back' to 'front' of the teeth, thus completing a clean, sharp point which is as near to a side-ground point as surface-grinding will permit.

The result obtained by the long Grinding Roller is not nearly so good. True, the roller is provided with a traversing motion which gives it a lateral movement and prevents the creation of a 'chisel' edge, but owing to the inability of the wire to escape from the contact of the emery except by its rotary or forward motion, the side-grinding effect is not so evident nor so clean as with the traverse wheel grinder.

Another point worth considering, when comparing the two types of grinders, is the 'hooking' or 'fusing' of the metal ; with the traverse-wheel, the wire has considerable time to cool off after abrasion and before the return of the grinding disc, whereas, with the long roller, the wire revolving at a high speed and coming into contact across the full face of the card at every revolution, is liable to be unduly punished by the incessant abrasion.

**Frequency of Grinding.** No hard and fast rule can be laid down, which will apply to all alike, in regard to the frequency with which cards ought to be ground. A great deal depends on the class of cotton in use, counts spun, and weight carded. We would advise, however, **frequent** grinding with **light** setting, rather than heavy grinding at long intervals. The grinding of card-clothing by the spinner may be likened to the stropping of a razor ; frequent stropping is necessary to keep the instrument in good order. In the case of card-clothing frequent light and short intervals of grinding freshens up the points ; little need be ground off, but the cards will respond and the quality of the sliver will repay the extra trouble.

**Light and heavy setting.** There is a happy medium in the setting of grinders. Grinders should never be set so deep as to cause sparks ; on the other hand, the setting should not be **too** light ; one is almost as bad as the other so far as the work produced is concerned. The emery should be set into the wire to such a depth as will create an easily audible 'hiss' without the semblance of a spark ; this will allow the wire to be deflected and scored all round its extreme point without undue harshness. If the setting should be too light it is useless, as the wire will only be 'topped' and polished rather than scored.

**Barbs and Hooks.** Heavy grinding is the cause of 'barbs,' hooks, and fused points rendered soft by the flowing of the metal. The correct fibre-carrying points are only to be obtained by careful setting, and the employment of the right emery grain. Heavy setting should be avoided as the points produced tear the fibre and rob it of that silky, wax-like coating which gives the lustre to the finished yarn, the attainment of which is so much sought by the spinner. An indication of heavy, defective grinding is frequently to be traced in the accumulation of fine white powder on the coiler-can cover.

**Speeds.** Speed is everything in grinding, not only of the grinder but of the article under treatment. The speed of cylinders and doffers has, at various times, been a controversial question, but as excellent results have been gained by running the cylinder at working speed (doffers proportionately) this speed has now been adopted almost universally, thus :— Cylinders 50″ diameter 160-170 revs. per minute ; doffers, about 340 revs.

Without question, the speed of the grinder should be **fast** ; this applies to both Traverse Wheel Grinders and Long Grinding Rollers. We recommend not less than 550 revs. up to 750 revs. per minute for grinders 7 inches diameter ; other diameters in proportion.

**Grinding preparations.** Care should be exercised, before commencing to grind, to discover the presence of deflected or crushed teeth, caused by the penetration of hard, foreign matter in the form of seeds, etc. If these deflected wires be left for a period of time, they will ultimately cause trouble when drawn up by the action of the stripping brush through being of greater length ; long individual wires of this description should be discovered and clipped off. Embedded seeds should be picked out, as they are sometimes so deep as to defy the stripper and are deleterious to the carding, inasmuch as they distort the wire-teeth and cause 'felting,' *i.e.*, the accumulation of matted fibre.

**Alignment.** The grinding steps should be periodically examined to test the alignment with the cylinder ; should these be out of line, either vertically or horizontally, oblique grinding will result. The tube of a traverse wheel grinder forms a reliable testing-shaft for this alignment.

**Care of Grinders.** Much has been said of the emery-covering of grinders, but in addition to this, the greatest care should be taken to keep all the parts of grinders in as perfect a condition as possible. The fact must not be lost sight of that the grinder is called into requisition to ameliorate conditions which demand the employment of a perfect instrument ; if the cylinder, or doffer, or flats, or whatever organ is in question, requires truing-up and re-pointing, the grinder which is to do the work must of necessity be true in itself, but how often has it been demonstrated that the carder has had to put up with grinders possessing worn and hollow shafts, strained tubes, rocking grinding discs and numerous other complaints

The emery covering, although the prime factor, is not a cure-all for all the ills grinders are heir to. It is a wise and economical plan to send all the grinders in use periodically to

the makers, say once a year ; let them, with their special tools, specially-trained labour, with expert knowledge gained by experience, put all the grinders into first-class condition and there will be an end to 'putting-up' with maimed tools, and 'making the best of a bad job.' It will be cheapest in the long run.

Of course every mill is not in the position of being able to run to the machinist ; in the case of the majority of foreign spinners, whose mills are far removed from expert machinists' shops, they have perforce to accomplish this work themselves, and to these we say this :—Do not attempt home-made repairs of a grave description ; if the parts at fault are vital, it is a 'penny-wise, pound-foolish' policy to allow unskilled labour to tamper with them. Rather replace the old grinder with a new one, except where accidental damage has occurred to an otherwise faultless grinder, in which case it may be cheaper to ship the grinder to the maker for repairs.

**Card-Grinders are precision tools** in the manufacture of which the minutest care has been exercised ; the condition of the carding depends to an enormous extent on the condition of these tools, and no efforts should be spared to keep them in as perfect a condition as possible. Always remember that the quality of the sliver is dependent upon the grinders, and that neglect of the latter is bound to have its direct adverse effect upon the former.

# The Grinding of Cards in the Mill.

## 2. Revolving Flats; on the Card.

SINCE the introduction of the Revolving Flat Card, and up to recently, it has been the general custom to grind the top-flats with the Long Grinding Roller, the latest and most improved type of which is the Patent Improved Long Grinding Roller No. 112, adapted for and covered with emery filleting, and fitted with encased traversing-motion, Figs. 37 and 40. Of recent years, however, there has been a tendency on the part of spinners to adopt the Traverse Wheel Grinder for this work (Fig. 35). In the opinion of those who have adopted it, and they are many in number, the use of the traverse-wheel grinder conduces to appreciably better carding-points.

**True grinding in position impossible.** Whilst acknowledging the desirability of having the truest possible medium for grinding the top-flats on the card, we are nevertheless convinced that the local conditions obtaining with, and inseparable from, revolving flats, militate against true grinding no matter how faultless the grinding instrument may be

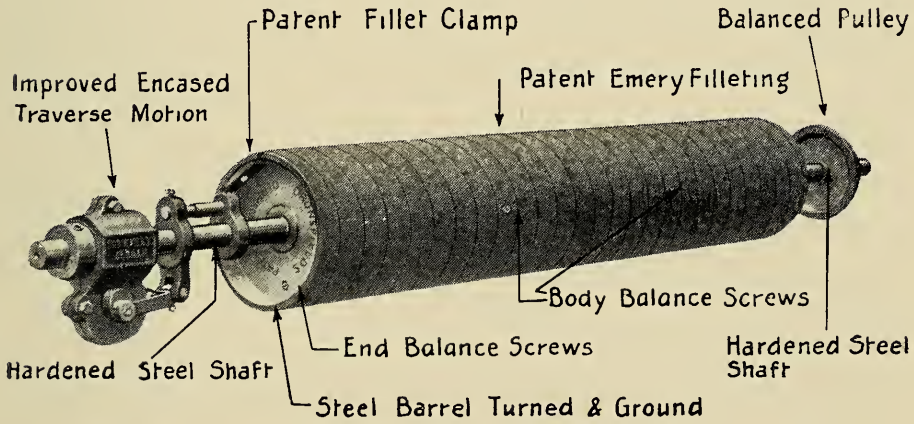
**The only 'true' grinding system.** In order to keep the flats as true as practicable for the whole period of their existence, we advise the dismounting of the top-flats, say once per annum, for the purpose of giving them a thorough grinding, in carding position, on a separate Flat Grinding Machine, such as we make for the purpose in the form of our No 12 Automatic Flat Grinding Machine. (See Article 3, page 74.) There are nearly 3,000 of these machines in use, so

## DRONSFIELD'S PATENT IMPROVED

# LONG GRINDING ROLLER No. 112,

## with encased Traverse Motion.

**CODEWORD—LONGROLL.**




**BALANCE TEST: 2,000 r.p.m.**

**Fig. 40.**

**Detailed inventions and improvements.**

we may be pardoned for our conviction that flats cannot be ground true on the card under working conditions. But this remark applies only to the question of '**true**' grinding of the flats one with another and each in itself. It does not affect the 'point' question.

**The best pointer.** When card-clothing has been working for a period, the card-teeth lose their points, and these points have to be replaced by some system of grinding. Logical reasoning is against the system of taking off the flats **every time** to grind them on a separate machine ; as a matter of fact, they don't require it, but after a period of, say 12 months, the ever-increasing irregularity through daily wear and tear, coupled with the impossibility of coping with the same in a proper manner on the card, renders it essential that the flats should be taken off in order to give them a thorough overhauling.

Which type of grinder, then, gives the best all-round results in grinding the flats in their normal position, *i.e.*,—on the card ? We believe the Traverse-Wheel Grinder to be the best in this case also, for two reasons :—

1st.—**Truth.** By grinding on a dead-true line, as previously explained, a truer result is possible than with the Long Grinding Roller.

2nd.—**Point.** The Traverse-Wheel undoubtedly grinds a better carding point.

The first of these reasons—'Truth'—has been gone into already (pages 62-63), and we can add nothing to the theory advanced. We have also debated the question of 'Point' produced by both appliances, and the same theory applies but in a greater degree ; the benefit derived from Traverse-wheel grinding on top-flats is substantially greater than on cylinders, doffers, or other quick-moving organs.

To resume, top-flats move very slowly, in fact so slowly that they may be said to be almost stationary so far as any assistance they lend to the grinder by their surface-speed. Now, taking the long grinding roller as the grinding medium ; as stated previously, the full width of the card-covered flat lies against the full width of emery ; the wire teeth of the flat are deflected in alternate directions (see Figs. 38-39) by the lateral traverse of the roller, but as the flat moves so slowly it has not even the opportunity possessed by the quickly-moving cylinder or doffer to escape from the emery. This results in alternate 'buckling' of the wire from side to side, as the grinding roller changes its course. It will be readily seen that the result of this 'buckling' will be a rough point, which, if magnified, will present to the eye a surface totally different to that revealed by the point produced with the Traverse-Wheel Grinder.

The necessity for 'burnishing' may be attributed very largely to the long grinding roller system of grinding, as it is necessary to get rid of the barbs, or as the card-maker terms it, the 'arage' left on the points, otherwise the staple will suffer.

**"Side-brushing" action.** We are not alone in our opinion that the Traverse-Wheel Grinder is the best for grinding top-flats ; many mills, which rank amongst the most successful in the world, now use solely this type of grinder, having found its use so advantageous. The alternate 'side-brushing' action which permits of the wire-teeth regaining their vertical position after the abrasive contact, undoubtedly conduces to a cleaner and sharper point, without 'barb' or 'hook,' a point which will retain its edge longer and do better carding, and this with less loss of wire in the grinding process.

**Grinding time necessary.** Some may ask "Does it not take very much longer to grind a set of flats with the Traverse-Wheel Grinder than with the Long Grinding Roller, considering that in the former case the emery disc is only $3\frac{1}{2}$

inches wide, and in the latter case it is the full width of the card ?" Our reply is to the effect that it takes a **little** longer, but not much, by reason of the fact that the traversing disc is grinding a **point,** the right form of point, **all** the time it is working. The Long Roller, although covering the full width of the flat, does not succeed in this as previously explained.

**Time not of paramount importance.** In any case, the time required for grinding top-flats is not of paramount importance, seeing that the flats are ground during the carding process, *i.e.*, whilst at work. Hence, there need be no loss of production created through paying a little more care and attention in thus attempting to procure the best results by grinding the top flats in the most approved manner.

**Traversing Speed.** The traversing speed of the grinding wheel, when operating upon top-flats, is faster than that arranged for grinding cylinders and doffers. The quicker traverse has been proved to give better results by creating a brisk 'side-brushing' action upon the wire, and at the same time causing the grinding wheel to cover correspondingly greater surface of the flat in its lateral traverse ; this quicker traversing-speed has been introduced to counteract the slow surface speed of the flats. The traversing-speed recommended for grinding flats is about 6 traverses per minute, and this speed is given automatically by a specially-geared differential motion with 38 teeth in the driving pinion, and 50 teeth in the motion-box. As previously stated, the gears for the grinder used on cylinders and doffers are 35/40 respectively.

**Rotary Speed.** To obtain the maximum of efficiency in card-grinding, and especially in the grinding of top-flats, we re-iterate that the rotary speed of the grinding medium should be a fast one. (See page 65.) The abrasive substance will thus have the power to grind the wire-points cleanly, striking away the fibres of metal, which otherwise by using a slow-moving grinder, would be left hanging on the points.

**End-clearance.—"Dwell."** It is advisable, where possible, to allow the emery wheel to pass clear of the wire at each end of the traverse, but where the construction of the card will not permit this, *i.e.*, where the major-brackets carrying the grinder steps are fixed too close to the ends of the flats to permit of the clearance of the full width of the grinding-wheel, say $3\frac{1}{2}$ inches, we have devised and introduced into the traversing mechanism an arrangement which causes the said wheel to 'dwell' for a few moments at each end of traverse, before reversing; this 'dwell' compensates for the loss of grinding which the ends of the flats would otherwise sustain were the wheel to return immediately; the dwell is thus a preventitive of high ends. Most of the carding-machine makers to-day, by reason of the rapid adoption of the traverse-wheel grinder on top-flats, have altered the design of the grinder-brackets so as to permit the grinding wheel to pass clear of the wire.

## The Grinding of Cards in the Mill.

## 3. Revolving Flats; off the Card.

SINCE the introduction of the Revolving Flat Card, the true grinding of the top-flats on the card has been a thorn in the side of all the makers of the same. Motions innumerable have been designed and applied with a view to securing accurate adjustment of the individual flats to the grinder, so that each and every flat should be ground alike and set equally to the cylinder, but the fact remains that local conditions and the multiplicity of parts have militated against this result, and although some of the grinding motions have improved matters to a certain extent, it is yet evident that perfect results cannot be accomplished in grinding flats upon the Card.

Regular setting of top-flats can only be obtained by having the flats all of one height from the seating, or sliding-face, to the point of the wire surface. If this result cannot be obtained by grinding flats upon the card, and we maintain it cannot, the flats should be dismounted and ground upon a separate machine.

The Machine now universally used for this purpose is the **Automatic Flat Grinding Machine, No. 12, with Flat Tester,** as illustrated in Fig. 41. In designing this machine, we have had in mind the strict importance of supplying a machine which will do the work without necessitating extra labour, nor of specially skilled labour A further matter

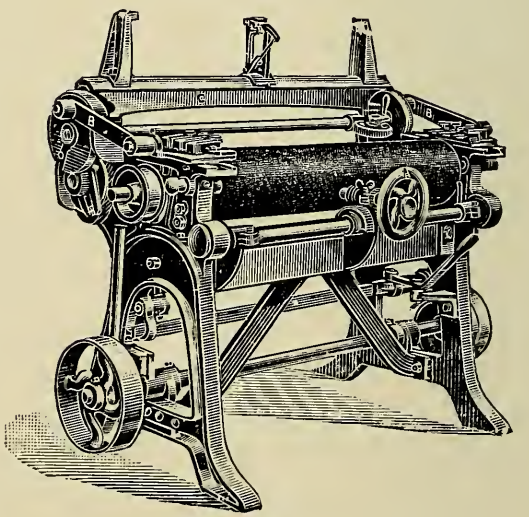


*Fig. 41.*
*Patent Automatic Flat-grinding Machine, No. 12.*
*Codexord—Autoflat.*

which is worthy of consideration, in dealing with the method of separate machine grinding, is that opportunity is given, whilst the flats are dismounted, of cleaning thoroughly the bends, and 'unget-at-able' parts of the card ; the chains, chain-screws, etc., can be thoroughly overhauled and the machine put into good order generally.

The characteristics of the Automatic Flat Grinding Machine, and the objects it is intended to accomplish, are here put forward in the form of a series of questions and answers. The questions are such as will evolve themselves in the mind of the prospective user, and we hereby anticipate and reply to them :—

## High and low flats.

*Why should the Automatic Flat Grinding Machine be necessary for the grinding of revolving flats?*

Because it is **impossible** to grind flats true **on the card** and true flats are a 'sine qua non' to good carding. Regular setting can only be obtained by having the flats of all one height from the seating or sliding-face to the points of the wire surface. Where flats are irregular, *i.e.*, **high and low,** a large percentage of the carding capacity is lost. According to the statement of a leading expert the presence of high and low flats on the card is conducive to the "**loss of certainly one-third, and probably one-half of the theoretical carding capacity.**"

## Duplicated Deflection.

*Why is it impossible to grind flats true on the Card?*

For many reasons, some of which are here set forth :—

1. When grinding on the Card the Flats are ground in a position the reverse of the carding position ; in other words, they are ground with the wire **upwards** ; they card with the wire **downwards.** Thus the natural deflection of the flat itself is not rectified in grinding,

but rather the reverse ; it is duplicated. Fig. 42 depicts this deflection of the flat in both carding and grinding positions.

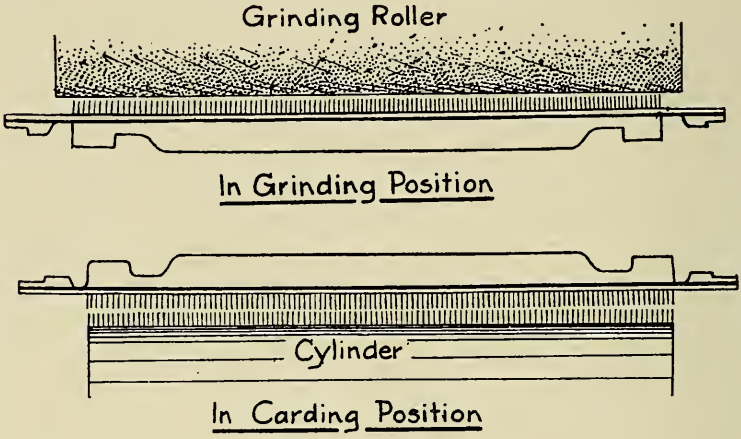



*Fig. 42.*

**Natural Deflection of Flats.**

## Chain Elongation.

2. The flats are drawn over the bends by two separate chains in which elongation takes place ; the wear of these chains is never alike, so that often the flat is presented to the grinder tangentially and not on a parallel plane.

## Unequal temper of wire.

3. Owing to the difficulty of hardening all the card-wire alike, some flats wear quicker than others. The flats clothed with the hard wire refuse the abrasion of the grinder and high flats result. It often takes weeks of grinding on the card to reduce these high flats to the average height of the others. With the Auto Flat Grinding Machine, it is a question of only a few minutes.

## Carding position.

*How does the grinding of the flats on the Auto Flat Grinding Machine overcome the 'deflection' difficulty?*

The flats are secured in bevelled seatings to match the bevels of the milled end-faces of the flats ; these seatings

are fixed to the sliding chairs which traverse the flats, **face downwards,** *i.e.,* **in carding position,** over the grinding roller.

## Automatic motions.

*Does the machine demand constant attention ?*

No! The **feeding-down** of the flats is **automatic,** and **the machine stops automatically when the flats are ground true.** All that the operator has to do is to insert the flats, and change them after grinding.

## Capacity.

*How many flats are ground at one time ?*

The machine is adapted to grind 3 flats of any type at one time, but the 'throw' of the traverse will permit of 4 of the modern narrow flats being ground simultaneously.

*How long does it take to grind a set of, say,* 108 *flats ?*

The time depends on the condition of the flats. With a set of an average irregularity of, say, 6/1000's, it takes about two days.

## Operator's discretion unnecessary!

*Is the time necessary for grinding the flats at the discretion of the operator ?*

No! The speed of 'feed' has been fixed, after numerous experiments, to ensure that every flat shall be ground true and provided with good carding points when it emerges from the machine. If hardened steel wire is 'rushed' in the grinding, hooked points will result. With the automatic feed this defect is eliminated ; the flats feed down to the grinder at such a speed as will permit the wire to be ground away cleanly, leaving upon the points neither barbs nor hooks ; **the operator cannot use his own discretion.**

## Operator's time not monopolized.

*Where this machine is in use, does the operator confine all his attention to it ?*

No! Whilst the machine is grinding and automatically feeding the flats down into contact, the operator is at liberty to do other work, viz. :—Card-stripping, cylinder and doffer grinding, and so forth.

## 'Honing' and 'Stropping.'

*Should the grinding on the card be entirely relegated in favour of this system of separate machine grinding?*

No! The machine should be used for periodically truing up the flats in a thorough and positive manner. As the carding points wear off, it is necessary to touch them up occasionally with the portable card-grinder on the card. To use a homely simile, the Automatic Machine-Grinding may be likened to the 'honing' of a razor ; the portable grinder is the 'stropping' medium.

## Machine-grinding Routine.

*What routine is most frequently followed in grinding flats separately on the Flat Grinding Machine?*

Most of the users of this machine have adopted the system (which in our opinion is the best), of going methodically through their cards, having the machine in constant use by taking the cards in turn. The best method is to procure an extra set of top-flats ; grind this set and then mount these flats in the place of those on card No. 1 ; the latter may then be ground and will take the place of those on No. 2, and so on. By following this routine the card is not stopped whilst the flats are undergoing renovation, and there is no production lost.

## A Key to Economy.

*Does the machine serve any other purpose than that of grinding the flats regularly and consistently?*

Yes! It serves for grinding occasional high flats which interfere with the setting ; for instance, odd new flats. It is also a **means of economy** at the time flats are being re-clothed. Upon examination of a worn set of flats, it will be found that individual flats to the extent of sometimes

20% of the whole, have still 2 to 3 years life in them, perhaps more. With the aid of the Automatic Flat Grinding Machine, all these good flats may be taken out and made up into full sets by grinding them all to the same height of wire. Without such a machine, the good flats must be discarded with the bad ones.

## Number of Machines necessary.

*How many Auto Flat Grinding Machines are needed in a mill?*

Every mill should have at least one, no matter how many or how few cards they may possess. We advise **one machine to every 50 to 75 Cards,** according to counts spun and class of cotton used. This number will permit the certain grinding of every card at least once per year.

## MANIPULATION OF THE PATENT AUTOMATIC FLAT GRINDING MACHINE, No. 12.

**Testing.** First, test the set of flats to find the **lowest** or most-worn flat ; this is accomplished by the aid of the Flat-Tester mounted on top of the machine. Now, test the lowest flat to discover the amount of irregularity. Each mark or division on the Testing-Arc, Fig. 43, is equivalent to 2/1000's of an inch, so we will assume that the amount of irregularity from end to end of the lowest flat is 3 marks, *i.e.*, 6/1000's. This lowest flat, after having been ground true, becomes the standard flat, to which all the others will be automatically ground.

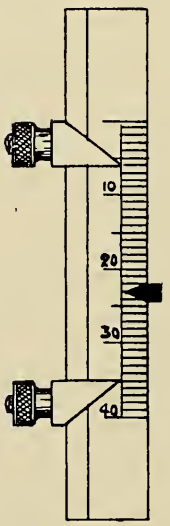



*Fig. 43.*
*Flat-Testing Arc.*

**Setting.** Place this flat in the centre seatings (the seatings are cut to receive 3 flats at a time, but grind only the lowest flat at the commencement of a set). Then wind the handle of the automatic feed until the

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indicating finger points to the figure 3 on the graduated cam of the feed motion ; *i.e.*, 3 marks or 6/1000's from the bottom point of the feed. Now, start the machine and bring the flat into contact with the grinding roller by the front setting wheel. As soon as grinding contact is established, **lock** the setting wheel with the locking nut, and **do not touch the setting wheel again,** until the whole set of flats is completed.

**Automatic Feed.** The Automatic Feed Motion will then cause the flat to descend gradually from '3' to point marked 'bottom,' which is the point at which feeding ceases. When 'bottom' is reached, the machine will have ground away the three marks of irregularity, leaving the flat true.

**Automatic Stop.** The machine will continue to run, however, until the point marked 'stop' is reached, when the automatic stop-motion will bring the machine to a standstill. Between 'bottom' and 'stop' the flat is gradually lifted out of contact, to finish off the points and release any clinging fibres of metal.

**Changing and Re-Starting.** The standard flat is now removed and any 3 flats inserted ; to save time, three flats of as nearly corresponding height as possible are put in together. The auto-feed motion must now be wound by the handle until the pointer registers 'Top.' Start the machine and wind the handle until the flats are in grinding contact ; then leave the machine and the flats will descend automatically like the first flat. No matter where the flats commence, the stopping point will always be the same and every flat will register the same height as the first or standard flat.

**Equal Abrasive Contact.** The three flats are traversed to and fro over the grinding roller by special gearing

of our invention. This differential gearing certifies positively equal contact of the flats with the grinder. Without this patented arrangement of gearing the two outside flats would have a tendency to dwell on the roller, causing them to be ground more than the centre flat, but the fact that every Auto Flat Grinding Machine is tested by the actual grinding of 3 flats simultaneously, to 1/1000th part of an inch, before leaving the premises, is proof positive of its efficiency.

## The Grinding of Cards in the Mill.

### 4. The Licker-in.

**Licker-in neglect.** In reviewing the appliances for ameliorating the conditions resulting from the daily wear and tear of the organs of the carding-engine, it may be safely asserted that the Licker-in has received of all, the very least attention. Cylinders, doffers, top-flats, rollers and clearers, to name all the other carding organs, have from the early days of cotton spinning been subjected to careful attention, with a view to enabling them to render continuously the maximum of service with the highest possible efficiency; to wit, the numerous devices for grinding and truing-up carding surfaces, positive mechanical card-mounting apparata, stripping devices, etc., in fact, everything possible to assist in improving the cleanness and the evenness of the sliver or web.

On the other hand, the Licker-in has, it would appear, been totally neglected after its first introduction into the card. No matter what damage occurs to the Licker-in, it has been allowed, nay, has had perforce to go **from bad to worse** for the lack of the necessary appliances with which to ameliorate the conditions.

**Importance of Licker-in.** By reason of its encased position on the carding-engine, and the absence of routinal inspection such as the other carding organs are compelled to receive from their normal and regular treatment, the Licker-in is very frequently forgotten, and, by many, regarded as a minor detail in the process of carding. Such a wrong presumption is to be keenly deprecated. The Licker-in determines to a very large extent the evenness, the cleanliness, and the strength of the sliver. And this is not all; from an

economic point of view irregular Lickers-in possessing dull and bent teeth are indirectly a source of great damage to card-clothing.

**Its share in cleansing fibre.** The Licker-in has been designed to take its part and due share in the actual carding, in other words the cleaning and combing out of the cotton into an even fleece of parallel fibres. To do their work thoroughly the teeth of the Licker-in ought to be sharp and erect, and the surface of the teeth should present a perfectly true line from end to end and circumferentially. If the roller does not possess these attributes, the carding is bound to suffer to a proportionate extent, as the cotton will be detached from the lap in lumps containing broken seeds and foreign substances which are not easily released, but are carried forward into the cylinder and flats and become eventually embedded in the wire.

**Licker-in troubles.** When the Licker-in is replete with regular lines of sharp and erect saw-teeth, the cotton fibre must of necessity be taken from the lap in detached form and passed on to the cylinder uniformly, but it is an indisputable fact that from the moment of the insertion of a new or re-clothed Licker-in **it gradually deteriorates.** This deterioration arises from several causes, but in the main, the two principal defects are :—

1st. **Bent Teeth,** caused by the passage of hard substances, such as pieces of wood, leather, nails, tacks, and the like. Quite frequently pieces of bale-hooping have been known to penetrate.

2nd. **Blunted points** and **irregularity of surface,** created by normal wear and abrasion by sand, broken seeds, leaf and other foreign matters.

**Lack of special tools.** Up to a very short time ago, owing to the absence of special tools, it has not been possible for the spinner to remedy the defects of the Licker-in on the premises, and, to use a colloquialism, he has had to 'grin and bear,' permitting matters, perforce, to go on from bad to worse. Eventually the Licker-in, becoming too badly damaged to work even passably, has had to be sent away to be re-clothed.

The practical carder will need no convincing of the vast importance of true and sharp Lickers-in, and he will recognize the value of the machine of which these pages form the text, viz. :—The Patent **Licker-in Grinding and Dressing Machine,** No. 93, Fig. 44.

**The Modern Way.** This Machine is the first and only one of its type. With the aid of it, spinners are now enabled to overcome the difficulties created by damaged and worn Lickers-in on their own premises, and may, by routinizing the treatment of same, keep them up to the mark and capable of doing their proper share of the carding. By so doing, the cylinder and flat-clothing (or the roller and clearer-wire as the case may be) will not be unduly punished and distressed by the passage of heavy seed and other foreign substances. Cleaner and more regular slivers will result ; the card-clothing will last longer, and finally, the inconvenience of sending Lickers-in away to be repaired will be saved and the cost of up-keep lessened.

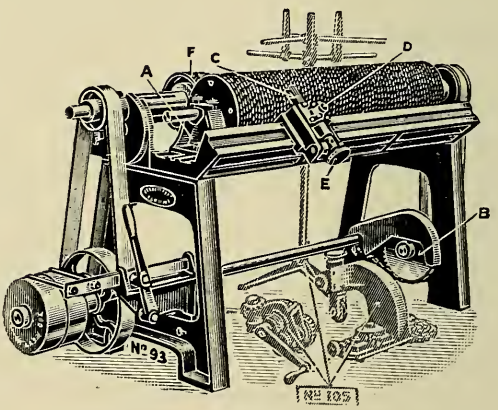



*Fig. 44.*
*Patent Licker-in Grinding and Dressing Machine No. 93.*
*Codeword—Lickpoint.*

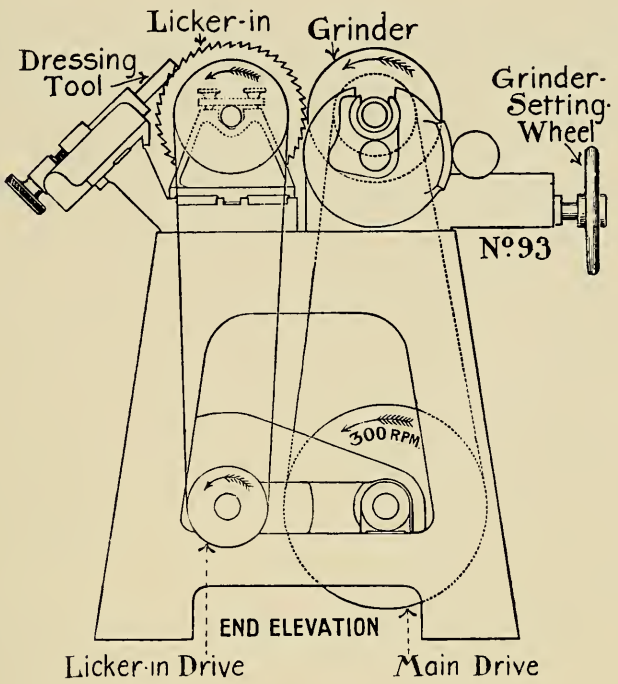



**Fig 45.**
**End Elevation.**
**Patent LICKER-IN GRINDING & DRESSING MACHINE,**
No. 93.

**Manipulation.** The sketch, Fig. 45, illustrates the driving plan in elevation of the machine. The machine is designed for dressing or straightening-up the bent teeth, re-pointing the teeth, and for grinding parallel and cylindrical the surfaces of **all** kinds of rollers covered with "saw-tooth" wire. It is simple in construction and requires no skill to operate.

**Adaptability.** The pedestals carrying the licker-in are adjustable so as to enable the machine to accommodate all lengths and all diameters of rollers. The licker-in is rotated at the correct speed by the pulley shewn (Fig. 45).

**Dressing Tool.** Fig. 46. The Tool-carriage carrying the Dressing or Aligning Tool C, is mounted on the slide and slides freely from end to end, not being attached to any leading

screw. This Tool consists of a number of hardened steel ploughs or blades which are made micrometrically to fit the spaces between the wire setting. The tool is easily fixed in its carriage and can be quickly changed when required to operate upon a licker-in with different pitch or spacing of wire. The adjustment of the dressing-tool is controlled by the vertical setting screw D, and the horizontal setting E. Where more than one pitch of setting of the licker-in wire is in use, extra tools are necessary ; most modern makes are comprised in two settings, viz. : 6 lines, and 8 lines to the inch of width. One tool is sent with the machine for one pitch of setting ; every other pitch requires an extra tool to suit it, but it is seldom that more than one pitch is in use in any one mill unless there is a variety of cards in use.

**The Dressing Operation.** The Dressing or Straightening operation is simplicity itself. The tool-carriage is pushed by hand to the end of the slide, and the ploughs of the tool C. are inserted in the spirals of the wire-setting. The rotation of the licker-in teeth running backward will then automatically conduct the plough tool along the rows of teeth from one end to the other ; any bent beeth coming into contact with the peculiarly-shaped ploughs are forced into a vertical position.

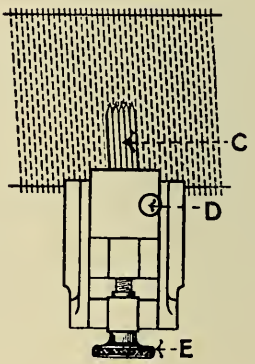



*Fig. 46.*
*Dressing Tool.*

**The Grinding Operation.** After the dressing operation, the licker-in is ground true and the teeth re-pointed. The grinding is performed by a patent Traverse Wheel Grinder, which is attached to the machine ; the traversing grinding wheel is covered with emery filleting which can be easily replaced when worn.

**Parallel Setting.** The grinder is carried in brackets which are actuated simultaneously by a single setting-wheel ; this ensures parallel grinding.

**Licker-in Grinding and Dressing Machine for various trades.** The Machine No. 93, of which the foregoing article forms the text, is adapted to serve the purposes of cotton spinners, being capable of dealing with the lickers-in of all revolving flat cards and roller-cards used in ordinary spinning. The machine will accommodate licker-in rollers from $8\frac{1}{4}$-in to 10-in. diameter. To meet the requirements of Woollen and Worsted Spinners, Garnetters, Cotton Waste Spinners, etc., another machine has been designed (Machine No 132) to accommodate the extreme sizes of rollers in use by the said manufacturers. The No. 132 machine is made in two sizes, one to take diameters from $2\frac{1}{2}$-in. to 18-in., and the other $2\frac{1}{2}$-in. to 30-in. The machine is of different design to the No. 93 described, but possesses the same principle characteristics as regards dressing and grinding.

**Licker-in Wire Mounting Attachment.** It would not be out of place here to call attention to the fact that a wire-mounting attachment is applicable to these machines. That applied to the No. 93 Machine is worked by hand, and is fully described on pages 49-50.

The wire-mounting attachment for the No. 132 Machines is of different construction and is operated by power, owing to the large and consequently heavy rollers which it has to deal with.

## The Grinding of Cards in the Mill.

### 5. Rollers and Clearers of Cotton Cards.

THE Rollers and Clearers of the Carding Engine which is still in universal use for carding waste, and for low counts generally, viz. :—the 'Roller and Clearer Card,' do not present the same difficulties in respect to grinding as the top-flats of the revolving flat cards.

**Cylindricity and Parallelism.** The principal features which it is necessary to maintain in rollers and clearers, are cylindricity and parallelism, and the machines used to create and preserve these attributes should be well and solidly constructed.

**Primitive and obsolete methods.** The roller and clearer card was the original type of card, and with the exception of minor improvements in detail, it stands to-day precisely the same in principal and general design, but the card is better built to-day and with greater precision ; wood cylinders, rollers and clearers, have been relegated in favour of iron. There are some users, however, who have still in use old, antiquated grinding frames, which are quite incapable of meeting modern requirements ; to these, we would call attention to the advisability of scrapping their antiques and taking advantage of modern methods with beneficial and economical results.

**Specialization of Waste-manufacture.** The specialization of waste spinning has conduced to the production of very high-class Roller - Cards possessing the greatest precision, and to meet the demand for grinding appliances capable of dealing with these precise organs we have designed several machines.

**Compulsory Dust Removal.** Modern demands and the trend of factory legislation now compel, in some countries, the automatic removal of dust and fly from the card-room and local positions ; to meet this, therefore, every grinding machine

should be fitted with a fan. The patent **Grinding Machine for Rollers and Clearers No. 2,** Fig. 47, is representative of a range of grinding machines which possess all the necessary characteristics appertaining to good grinding; all the machines in this range are fitted with dust-fan, and with patent parallel-setting motion for setting both ends of the card-rollers simultaneously to the grinding roller with one central wheel. The machines vary only in their capacity, being arranged to grind from one to four rollers simultanously.

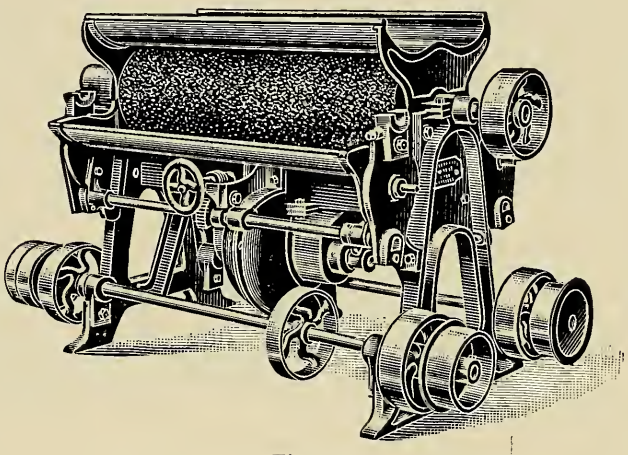


*Fig. 47.*
*Patent Grinding Machine No. 2, for Rollers and Clearers.*
*Codeword—Plexroll.*

**Waste and Speciality-Yarn Carding.** To meet the want for a machine to accommodate a diversity of rollers, clearers, and fancies, such as are now used in the later continental designs of roller-cards for the Waste and Speciality-Yarn trades, we have been called upon to design several other machines of which the patent **Roller Grinding Machine No. 22,** Fig. 48, is an example; this machine possesses all the improvements mentioned above, and is arranged to grind two rollers at a time, from 5-in. to 20-in. diameter. This machine has become popular with users of fine worsted cards.

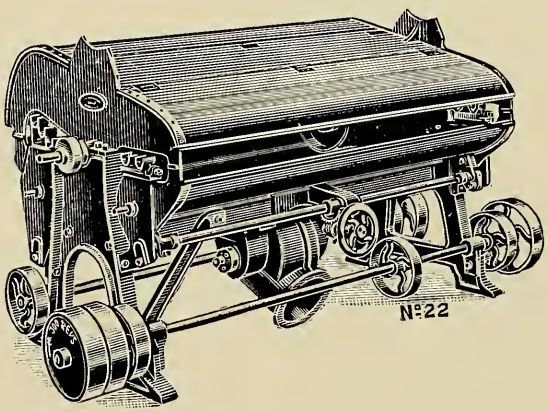



*Fig. 48.*
*Patent Grinding Machine No. 22.*
*Codeword—Biplexroll.*

## The Grinding of Cards in the Mill.

## 6. Woollen and Worsted Cards.

**Swifts and Doffers:**
**Workers, Strippers, and Fancies:**

**Antiquated Methods still in vogue.** The Grinding Frames and grinding appliances generally in use in woollen and worsted mills are yet, in many cases, of primitive and obsolete pattern, and are not calculated to produce the best and most economical results. In spite of the advancement in mechanical science, in which woollen and worsted manufacture has so largely participated, one sees even to-day in otherwise quite up-to-date mills grinding frames built of wood, ricketty and inaccurate, the grinding rollers roughly made, ill-balanced and anything but true on the emery-surface; in a word, anything in the shape of a grinder is considered good enough. Of course, this state of things does not apply in a general sense; it is merely a relic of old times when primitive, rule-of-thumb methods were the order of the day, but the proportion of mills where such conditions do still exist is fairly large.

**Importance of good 'tackle.'** In wool, as in cotton manufacture, the card clothing is of vital and paramount importance and lays claim to the greatest care and attention; nothing can do greater harm to the various carding organs, and ultimately to the production, than the utilization of second-rate grinding tackle. In the first place, all the card-covered rollers must be maintained true both in parallelism and cylindricity; this demands the use of a grinding frame of good stout construction without any tendency to vibrate, and devoid of 'backlash.' The emery roller should be true, well-covered,

and balanced to permit of high-speed grinding, especially in the treatment of hardened and tempered steel wire.

The **Steel Grinding Roller** No. 113, Fig. 49, depicts a roller which is eminently suitable for grinding Swifts and Doffers,

*Fig 49.*
*Steel Solid Grinding Roller No. 113.*
*Codeword—Woolrol.*

being substantially built, and heavy enough to prevent vibration when run at relatively high speeds. As its name implies, it is of steel, both barrel and shafts ; the latter are case-harderned.

**Traversing Motion imperative.** All grinding rollers, whether for use on swifts and doffers, or in the grinding frame upon workers, strippers, and fancies, should be fitted with a traversing motion, Fig. 49a. The reciprocal movement given by the traverse motion serves two purposes. 1st,—It equalizes the wear of the emery by distributing the abrasive contact over a surface equal to its own traversing distance ; 2nd,—It causes the emery grains to act upon the sides of the card teeth, giving a sharper and cleaner point to the latter. Under no circumstances should grinding rollers be permitted to run without traversing motions ; 'chisel' edges and 'stripy' grinding are an infallible result of such a procedure

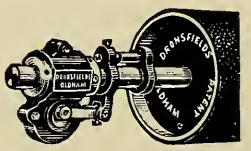


*Fig. 49a.*
*Encased Traverse Motion No. 117.*
*Codeword—Tofro.*

**The best 'point' grinder and finisher for Swifts and Doffers.**—Up-to-date Grinding. The

remarks in the foregoing paragraph apply naturally to grinding with the long emery roller only, but we would call the attention of the reader, interested in wool-carding particularly, to an apparatus which, to our mind, far excels the emery roller both as a 'point' grinder as well as in its ability to produce greater truth, viz. :—the Patent **Traverse Wheel Grinder**; this has been fully dealt with elsewhere in this manual (Cylinder and doffer grinding, pages 58-67), and although the theories advanced therein are written for the consumption of cotton spinners, they apply, nevertheless, equally to the grinding of swifts and doffers of woollen and worsted cards. Many worsted and fine-woollen manufacturers have recently adopted this type of grinder with gratifying results. It would perhaps be interesting to the English reader to know that the Traverse Wheel Grinder has been for a generation (in a more or less advanced state of construction) the standard type of grinder used by the woollen and worsted trades in America. We advise the reader interested in wool-carding to study the article above mentioned.

**Grease.** When operating upon woollen cards, a great drawback which is always prevalent is the grease which clogs up the emery surface and neutralizes the abrasive action. In this respect, grooved covering is of great benefit, as the regular lines of points of emery (the extreme points alone do all the grinding) stand clear of the grease, which embeds itself in the base of the grooves. With grooved emery, it is not a difficult matter to relieve the grease from time to time by scraping. From a grinding point of view, the grease would be better absent altogether, but as this is impossible, it would not be out of place here to remark that, where the **Traverse Wheel Grinder** is in use, the cost of recovering the grinding wheel

with emery filleting is trifling ; the grinding is performed more expeditiously owing to the fresh cutting surface frequently applied.

**Modern Grinding Frames.** The forward trend in the demand for good mechanical means of grinding workers, strippers, fancies, etc., has resulted in the production, by ourselves, of eight various types of grinding frames, each one adapted to meet its own peculiar requirements. The **Improved Grinding Frame No. 19,** Figs. 50 and 51, will serve for the illustration of this article as it combines the requirements in general of woollen and worsted carders, including accommodation for the attachment of the Turning-up Rest (Fig. 14) ; this may be placed across the slides, displacing for the time being the steps which carry the card-rollers. The grinding frame illustrated is very substantially built, having a good square base, eliminating vibration. Every part is easily get-at-able, setting-screws, card-roller steps, grinding roller steps, driving pulleys, etc. This frame will accommodate rollers of 3-in. to 30-in. diameter, thus making it a useful contrivance for carrying a doffer or a large worsted licker-in roller whilst undergoing repairs. Attention has been paid to detail, such as the provision of strap-tightening device for the card roller-driving bands, setting gauge-collars to ensure parallel setting, etc Other machines specially made for woollen and worsted

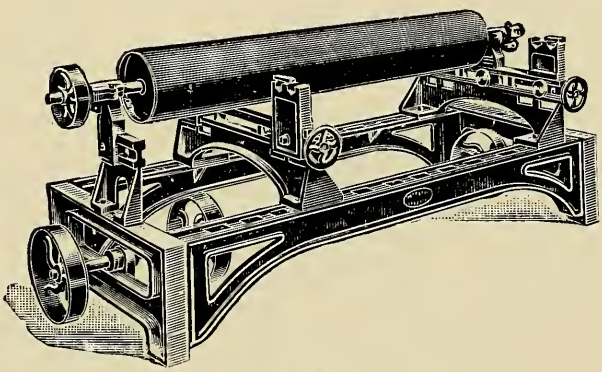
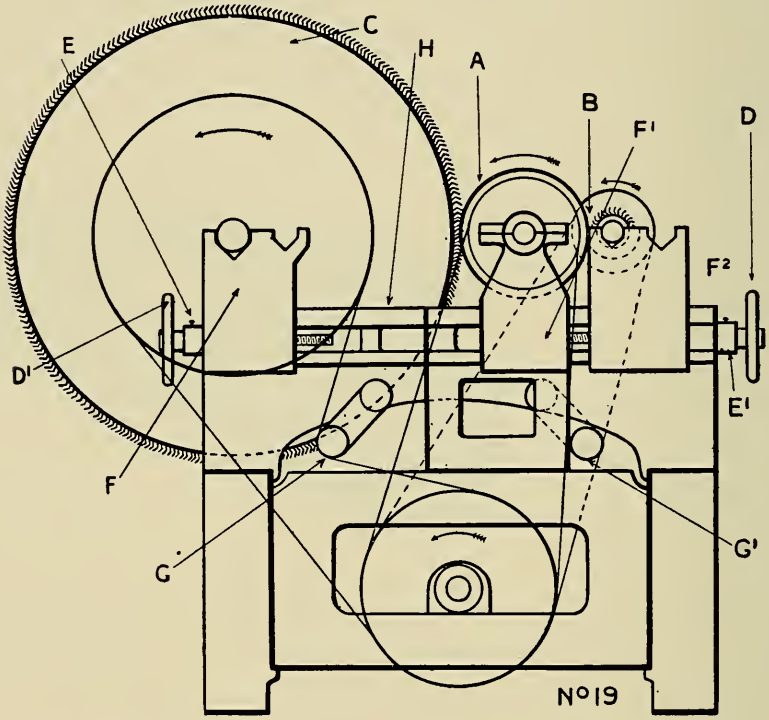


*Fig. 50.*
*Grinding Frame No. 19, for Workers and Strippers.*
*Codeword—Striplex.*

# Grinding Frame No. 19,

## FOR WORKERS, STRIPPERS, etc., :: :: OF WOOLLEN AND WORSTED CARDS.

**CODEWORD—STRIPLEX.**




A. Emery Roller.
B. Smallest Capacity Card Roller.
C. Largest Ditto.
D. Setting Wheel.
D1. Ditto.
E. Micrometer Dial.
E1. Ditto.
F. Movable Step.
F1. Ditto.
F2. Ditto.
G. Belt Tightener.
G1. Ditto.

**End Elevation.**

**Fig. 51.**

manufacturers are on the lines of the machine shewn in Fig. 48, in which both emery and card rollers are covered in to enclose the dust created by grinding, and a fan is fitted in the underframing of the machine to draw the dust away and deposit it outside the factory.

We would strongly recommend manufacturers to discard primitive and home-made grinding tackle and to replace with some such machine as is here described; better work and less worry is certain to result and the machines are by no means costly.

# Part IV.

# The Grinding of Auxiliary Machinery.

WE would not consider these pages complete if we did not include the grinding of the organs of the various supplementary machines which are used in the Finishing processes ; we refer to such Machines as the Card-Raising Machine, Cloth Calenders, Mangles, and Cropping or Shearing Machines.

## (1). The Card-Raising Machine.

This machine has replaced to a large extent the vegetable teazle-gig formerly used, in the woollen trade ; in the cotton trade to-day the card-raiser is the only medium in use for raising flannellettes, cotton blankets, cotton hosiery and other materials requiring a fleecy, napped surface. The Card-raising or napping machine is built up of rollers, varying from say 14 to 36 in number, covered with specially-set and specially-ground card-filleting. These rollers are arranged side by side in a circular frame thus giving the appearance of a cylinder. The rollers are of two kinds,—'pile' and 'counter-pile,' arranged alternately, the former serving to raise the fibre of the cloth to produce the 'nap,' the latter acting in a contrary direction and laying the nap down to produce the felted appearance on the cloth surface.

The majority of card-raising machines are built in wide widths, varying from 72 inches to 100 inches on the wire raising surface ; the width is arranged to accommodate the simultaneous raising of two pieces. The Card Rollers are small in diameter, from 3-in. to $3\frac{1}{2}$-in., the intention of this being to cause the teeth to stand well out individually, so as to be able to seize the nap and draw it up from the woven web of cloth

It is not our intention nor is it in our province to dilate upon the construction of the raising machine. Our aim is rather to create improvement in the working of this valuable accessory, to enable the user to obtain the fullest possible benefit from the use of it, and at the same time exercise economy in so doing, and we leave the machine with these few remarks upon its general construction.

**Clothing soon worn.** The introduction of the card-raiser resulted in greatly increased output, and while the rollers maintained the characteristics of parallelism and good napping points, the quality of the raising was undoubtedly better. It soon became evident, however, that the strenuous work demanded of the card-clothing quickly destroyed the parallelism of the roller surfaces and the needle-like points were soon worn away.

**'Lashing.'** Primitive methods of grinding were then adopted. No attempt was made to re-establish the parallelism of the card rollers, but a system of re-pointing the card-teeth, denominated 'lashing' was resorted to and became general. This 'lashing' system consisted of running the rollers teeth and teeth together meanwhile pouring into the card-clothing a mixture of emery and oil.

**Damage by 'lashing.'** In these days of advanced mechanical science very few cases obtain where this primitive method still exists. The damage caused to the card-clothing was ruinous ; the oil penetrated into the foundation rubber and this quickly deteriorated, and the teeth were bent or broken ; the teeth were loosened through the holes in the foundation cloth being enlarged by the severe strain upon the wire, and after being a few times subjected to the 'lashing' process were rendered so loose that they could not stand up to their work. The points of the card-teeth were to a certain extent improved, but at an enormous cost in ruined card-clothing.

**Soiled Card Rollers.** Furthermore, the rollers were so soiled by the mixture, that upon reinstating them in the raising machine it became necessary to clean them by operating upon a special length of waste cloth. This naturally meant loss of production and waste of time.

**Scientific grinding essential.** Some years ago, owing to the great increase in the adoption of card-raising machines and the corresponding number of complaints of the absence of specially designed apparatus to overcome the difficulties experienced in keeping the raising rollers parallel and of securing and maintaining the needle-points so necessary in raising, we were impelled to design and construct the Patent **Raising-Roller Grinding Machine No. 86,** Fig. 52, and this machine, more or less modified, is now in universal use. By its adoption the raising-rollers are maintained in good order right up to the dissolution of the card-clothing through normal wear and tear.

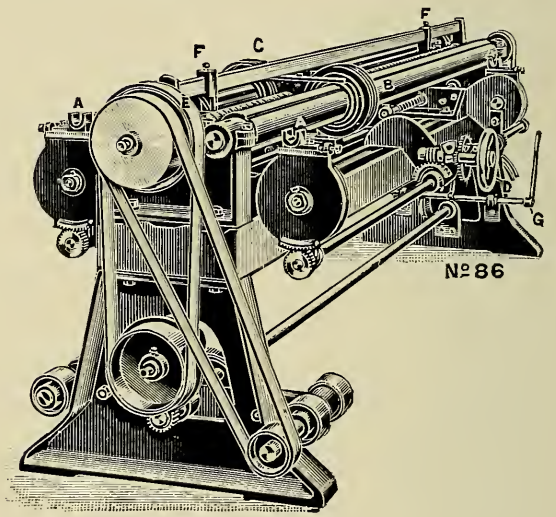



*Fig. 52.*
*Patent Raising-roller Grinding Machine, No. 86.*
*Codeword—Napoint.*

**Simultaneous 'truing' and 'pointing.'** The Raising-roller Grinding Machine, here illustrated, performs a duplicate service, truing the surface, and needle-pointing the rollers at the same time. The machine is arranged to grind two rollers at a time, one roller on the one side being surface-ground to produce a perfectly parallel and cylindrical result upon the

surface of teeth, whilst on the other side another roller is undergoing the needle-pointing process in exactly the same manner as the card-maker side-grinds the clothing in the first instance at the card-works. The roller is first needle-pointed, then it is placed on the surface-grinding side, another roller taking its place in turn for needle-pointing.

**Dry grinding.** The card-rollers are ground dry, *i.e.*, no oil enters into the modern method of grinding, hence the raising rollers are clean when they leave the grinding machine, and they are ready to resume work immediately without the superfluous passage of a cleaning cloth.

**Saving in passages of cloth.** After grinding on this machine, the rollers are, without question, better able to cope with their work. By reason of their truth and cylindricity they are in a condition to 'nap' evenly right across the full face of the cloth, instead of in patches. This means quicker raising with a corresponding saving in the number of passages of the cloth through the raising machine.

**Construction.** The Traverse Grinders are mounted on the frame and both are traversed simultaneously by one screw situated between the two grinder tubes. One tube carries a surfacing disc covered with emery-filleting ; the other carries a boss fitted with a number of thin consolidated emery wheels with bevelled edges (see Fig. 2). On each side of the machine is fitted a setting motion for setting the raising rollers to their respective grinders, and all rollers may be set and ground to the same diameter. The motions are actuated by a single setting wheel which commands both ends of the roller simultaneously, in this way preventing oblique setting and ensuring parallelism. The steps carrying the card-rollers are made so that they will move inwards at one end of the machine to permit of all lengths of raising rollers employed in the mill being ground.

The Traversing distance of the grinding wheels is governed by a new patent reversing motion which is operated by the reversing bar F, situated over the screw ; the positions of the two movable brackets on this bar control the distance of traverse.

**Side grinding (needle-pointing).** When side-grinding, *i.e.*, needle-pointing the teeth of the raising roller, the emery wheels are set gradually into the teeth, and the driving is so arranged that the wheels always run **with the spiral** of the card-fillet. This continuous following of the spiral, no matter what the direction of traverse may be, is controlled by the reversing motion automatically and is a matter of great importance in side-grinding, as, without it, the emery wheels would run **against** the spiral in **one** direction of traverse and they would be liable to cut off the teeth, or, at the least, score them badly.

## The Grinding of Auxiliary Organs

*—continued.*

### (2). Cloth Calender Bowls; Mangle Bowls, etc., etc.

OF recent years much attention has been given to the maintenance of the good working condition of Friction Bowls of all kinds used in Finishing, viz. :—Steel, chilled-iron and brass bowls, and the cotton, paper, and other fibre and rubber bowls. Up to recently, however, there was a lack of special tools for dealing with these bowls at the finishing works, but this difficulty has been overcome as will be seen by the perusal of the following.

**True Bowls and 'Finish.'** The quality of 'finish' produced by the Calender is dependent to a large extent on the condition, as regards truth of surface and cylindricity, of the calender friction-bowls. If these are untrue the frictional contact upon the cloth is of course variable; the result of 'finish' is on a par with the condition of the bowls.

**Cotton, Paper, and Fibre Bowls.** The cotton, paper, and fibre bowls generally suffer to the greatest extent by general wear and tear, owing to their softer and fibrous nature, but in course of time the surfaces of the steel and other metal bowls are affected.

**Causes of irregular wear.** There are various causes of the irregularity in the wear of bowl-surfaces. The principal wear is naturally that created by the passage of pieces which are not of the full width of the bowl surface, in other words the wearing of a hollow, caused by the constant frictional contact; then there is the irregularity of wear caused by the passage of pieces of varying widths. In all bowls there is the difficulty of high ends to contend with; in the case of a calender operating upon two pieces simultaneously the difficulty is further aggravated by the creation of a high place in the centre of the bowls. The penetration of adherent pieces of

starch causes much damage to the paper, cotton, and fibre bowls by indenting them. Another cause of untruth may be traced to changes of temperature which naturally has its effect upon the metal bowls in particular.

**Variable hardness.** Again, the material of which all bowls, other than metal, are composed, is of variable hardness. It is commonly known that these bowls are composed of compressed cotton, paper, husk, etc., which is mounted upon an iron or steel core and compressed by hydraulic or other pressure ; the whole body of material is then permanently held in position by stout iron ends of a diameter a little less than the material (see Fig. 53). It will be recognised that it is a practical impossibility to assure the even density or solidity of this mass of fibrous matter and hence the softer or more open portions must sooner or later 'give' under the working strain, gradually crumbling away and leaving hollow places.

*Fig. 53.*
*A Calender Bowl.*

**Primitive appliances.** The only means obta nable by the finisher (up to recently), for ameliorating the condition of the bowls of the calender, and that only as regards the 'fibre' and not the metal bowls, has been the slide and scraping tool, a very primitive appliance ; it consists of a slide-bed or rail on which is mounted a rest carrying a scraping tool. The bed was carried on a pair of brackets bolted on the framing of the calender opposite to the bowl and the scraper was pushed along by hand backwards and forwards in contact with the high projections of the bowl-face. When the bowls have become too irregular to operate upon in this fashion it has been the custom to dismount them from the calender, and where means would permit, to insert them in a lathe and turn the face up, a most costly process and a delicate one to boot, especially to the uninitiated. As previously stated, the metal

bowls have had, perforce, to continue from bad to worse without any amelioration of their condition.

**Modern Apparatus.** These conditions need no longer obtain. The Patent **Grinding Machine for Calender Bowls, No. 29,** Fig. 54, has been specially designed for dealing with the grinding of the faces of **all types of bowls** save copper, and is useful alike to users in all branches of trade where bowls of precision are 'sine qua non' to efficient production. Many of these grinding machines are now in use. The patent grinding machine illustrated has been designed to take bowls of all sizes both as regards lengths and diameters (within limits); it may be used for wet or dry grinding, wet for the metal and dry for the fibre bowls. Two kinds of wheels are supplied with the machine for this wet or dry grinding. The bowls are ground with the utmost precision; the setting collars are graded in 1/1000's of an inch. The Grinder proper is on the traverse-wheel principle but the traversing screw or worm is mounted externally in a tube of its own, thus leaving the tube which carries the grinding-wheel intact, *i.e.*, not necessitating a slot for the guide-fork connection which is essential in self-contained grinders; in this way, the grinder tube is very strong and rigid and not liable to 'sag' under the grinding pressure.

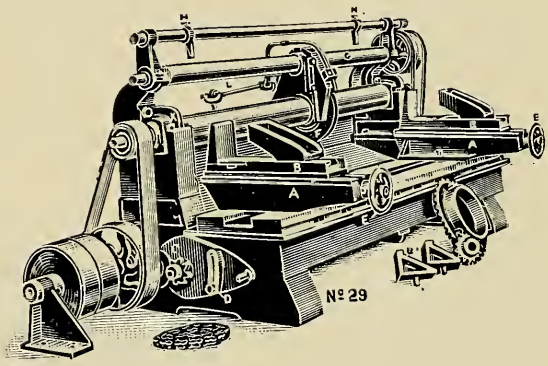



*Fig. 54.*
*Patent Grinding Machine for Calender Bowls. No. 29.*
*Codeword—Calbowl.*

**The most thorough method.** The utilization of a machine of this type is undoubtedly the most thorough method of getting up the various types of bowls. Whilst the Calender

(or other machine) is dismantled every bowl belonging to it can be thoroughly ground and put into first-class order ; thus, when they are replaced the machine is in a condition to do the very best work. It needs no further remarks of ours to enlarge upon the desirability of such conditions.

**'Scraping' superseded.** It frequently happens, however, that the fibre bowls of cotton, etc., require attention when the metal bowls are still in good condition, and it is for the purpose of truing these up that the scraping operation, already mentioned, has been found necessary. This primitive, slow, and unsatisfactory appliance has now been superseded by a specially designed apparatus which has the merit of doing the work mechanically, quickly, and with precision. We refer to the Patent **Calender-Bowl Traverse Grinder No. 98,** Fig. 55 This apparatus consists of a traversing wheel grinder built on similar lines but of greater strength, to that used for grinding cards. (Figs. 34 and 35.) This grinder is mounted in brackets which are adapted for bolting on to the frame-sides of the calender ; the brackets possess setting screws with hand-wheels for setting the grinder closer to the bowl as the high parts are gradually ground off until the face of the bowl is true, cylindrically and parallel. The grinding-wheel is covered with specially-made emery filleting, easily replaced when worn ; the filleting is simply wrapped around the face of the wheel and is held tight against same by the tension clips shewn in the illustration ; when the fillet is worn it is only a few minutes work to remove it and apply a new piece.

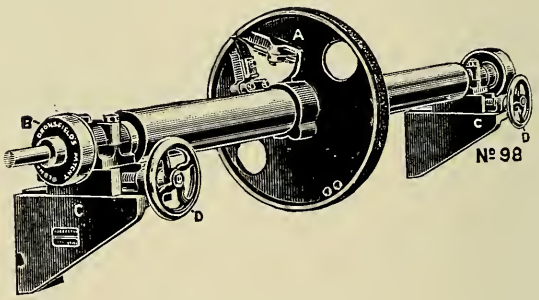



*Fig. 55.*
*Patent Calender-Bowl Traverse Grinder.*
*No. 98.*
*Codeword—Calport.*

Where Calenders of divers widths are in use a separate grinder-tube with its internal screw is necessary for each width ; all the other parts, viz. :—setting brackets, grinding wheel, differential motion, and driving pulley will serve for all the widths. For instance, supposing 40-in., 50-in., 66-in. and 72-in. calenders to be in use, one complete machine would be necessary for, say, the 72-in. calender, and three extra tubes with their internal screws or worms, *i.e.*, one for each of the other widths, interchangeable.

The appearance of the bowl-surface, after grinding, will be a trifle 'furry' owing to the semblance of a short nap left by the abrasive contact of the emery ; this disappears after a few minutes running under friction, the surface taking on an ivory-like polish.

## (3). Shearing—Machine Cutters.

THE efforts to improve the principal organs of the machinery in regular use in Finishing Works have now extended to the Shearing or Cropping Machines, the condition of the blades of which determines to so large an extent the finished appearance of the cloth. The Shearing Machine, more or less modified in detail, but possessing the main characteristics in general, *i.e.*, the combination of a circular spiral shearing roller with a flat ledger-blade, plays an important role in the finishing department. The shearing organs work in pairs, and their condition as relating to truth and sharpness is a certain indication of the quality of 'finish' they will produce. The Shearing Machine enters into many branches of manufacture,—cotton piece goods, woollen goods, carpets, hosiery, etc., and it is essential that the shearing organs, both the circular rollers with inset spiral blades and the flat ledger-blades should be maintained in as perfect a condition as possible. For the special purpose of treating these blades the Patent **Shearer-Blade Grinding Machine, No. 109,** Fig. 56, has been designed and is adapted to grind both types of blades The brackets which carry the flat ledger-blade whilst grinding, are so designed as to enable the blade-edge to be ground at any angle or square as desired. The grinding of shearer-blades on this machine is conducive to better shearing or cropping by rendering the circular blades perfectly cylindrical and sharp and the flat-

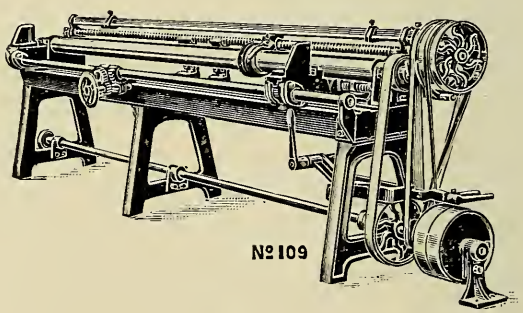



*Fig. 56.*
*Patent Shearer-Blade Grinding Machine, No. 109.*
*Codeword—Shearedge.*

ledger blades dead true, thus enabling them to be set with precision and assuring clean and even cutting.

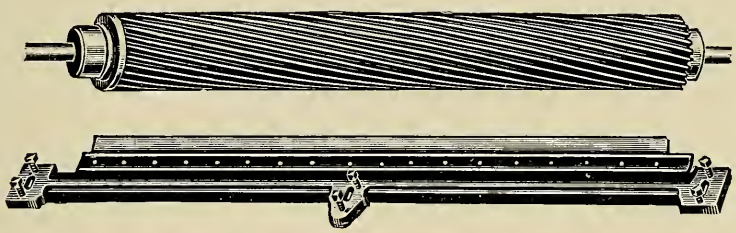


*Fig. 57.*
*Shearer-Blades (Circular Spiral and Flat-Ledger).*

# Part V.

# Card Stripping and Burnishing.

## 1. Cylinders and Doffers.

THE Stripping of cylinders and doffers of Revolving Flat Cards does not necessitate the employment of any instrument possessing extraordinary mechanical features. The **Stripping Roller, No. 126,** Fig. 58, is the medium universally adopted for this purpose The attributes of a good stripping roller are :—strength with comparative lightness and good material, well-seasoned wood which will not warp nor split. The roller illustrated is made of seasoned pine, mounted in lag-form upon numerous iron blocks which, in turn, are keyed upon a steel shaft ; the roller is turned true and afterwards clothed with hardened and tempered steel stripping fillet, with bend. (See Section.)

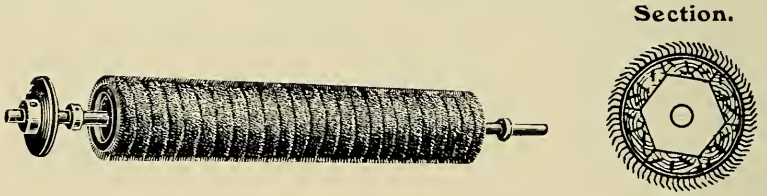



*Fig. 58.*
*Stripping Roller No. 126. Codeword—Stripper.*

**Automatic dust-removal.** The advent of the various systems of dust-removal when stripping, rendered compulsory recently by the new Factory Act (British), has, to a large extent changed the long-standing methods hitherto existent in cylinder and doffer-stripping. The Act, of which the reader will be cognisant, compels the automatic removal of the dust generated by stripping from the card-room premises, and the initiated will recognise the immense relief afforded by the Act,

safeguarding, as it does, the very lives of the operatives by removing the obnoxious and dangerous fine dust which, formerly, they were compelled to inhale as they stood over the work ; one of the chief causes of asthma, bronchitis, and lung affections in general has thus been removed. To-day, there have come into general use, so far as Great Britain is concerned, several systems of automatic dust-removing apparatus, some operated by vacuum generated by a pump, others by induced draught with the aid of powerful fans.

**Light-weight Stripping Roller.** We hold no brief for any one of these systems, save that in all cases it has been found necessary to enclose the stripping brush within a hood or casing, and as the latter containing the brush has to be portable and transferred from card to card, it has devolved upon us to produce a specially-light stripping roller, so as to minimise the total weight of the portable apparatus The Improved Light Stripping Roller is similar in appearance to the ordinary roller illustrated.

**Stripper Setting.** The stripping of cylinders and doffers is a simple procedure provided ordinary care be exercised. The setting of the stripper into the cylinder or doffer wire is the only important point to observe ; the wire should never descend so deep as the bend, or to be more accurate, it should never have any chance to penetrate below the bend of the wire of the cylinder or doffer as the case may be. This will have the tendency of plucking the teeth and disturbing the angle, besides destroying the surface-truth of the teeth points. The wire, and particularly the stripping wire, will also be quickly ruined owing to the increased pull at the roots, having the effect of enlarging the holes in the foundation and rendering the teeth loose. The correct depth for setting stripping rollers is about 1/8th of an inch ; this depth ought to be sufficient to enable the teeth to take hold of all the embedded fibre, etc., and extract it from the foundation.

## 2. Flat Stripping.

**The Stripping Comb and Spiral Brush-roller.** The stripping of all revolving flats is accomplished by means of an oscillating comb which, in its downward stroke, traverses the face of each flat as it is drawn over the sprockets after emerging from the cylinder. The comb should be very true and set as close as possible without permitting it to touch the points of the flat-wire, so that the teeth of the comb may grasp the protruding ends of the adhering fibres and draw them out from the wire as completely as possible. The flats, after passing the comb, come into contact with the spiral flat-stripping brush-roller, and this should remove all short fibres, seeds and other foreign substances left by the combing process. The stripping of flats is an important matter and great attention should be given to the condition of the comb and the spiral brush-roller and to the setting of same on the card. The flats, in order to accomplish their work to the best advantage, should be cleaned very thoroughly, and it will be easily seen that if the only permanent means provided for this purpose, viz. :—the comb and the brush-roller, are not carefully looked after, the flats are bound to become dirty, choked with seed and fibre and altogether incapable of clean and even carding.

**'Felting' and its causes.** It frequently happens that the bristle roller is incapable of withdrawing the loose remaining fibres and the pieces of broken seed, leaf, etc., from the flats, with the result that they accumulate in the foundation of the flat clothing and form what is known in the trade as 'felting.' Felting is deleterious to good carding, as it clogs the spaces between the teeth, and disarranges the order of the lines of teeth themselves, causing them to be bent through the forcing-in of pieces of hard seed and shell and rendering them what is termed 'dog-legged.' Felting cannot

altogether be avoided, but in some cases it can, and the reader may probably find in the following some explanation which will assist him in discovering and overcoming his difficulty.

In many cases the setting of the comb is at fault ; if this is catching the flat at any point it will crush the teeth and these will retain the fibre ; usually it is the 'heel' of the flat which suffers, and this can be easily traced by the presence of the back line of teeth, sometimes two or three lines, which will have a tendency to lean forward, loose in the foundation and angle distorted.

Again, it is a mistake to assume that deeper setting of the brush will relieve felting ; it will rather have a tendency to aggravate it by matting the fibre closer together. The deeper the brush is set, the more difficult it becomes for the bristles to 'pick' out the loose fibre and seed ; all they can do is to attempt to drive them out in the direction of their own rotary movement. The location of the card is sometimes accountable for the felting of top-flats. If the card is in direct line with a damp draught, or near a window in a damp position the wire is affected and especially on the side-ground portions ; this will account for the tendency of the wire to cling to the fibre. Of course there are conditions obtaining in many mills in which it would be absolutely impossible, even with the greatest care and attention to these various points, to prevent felting of flats. The class of cotton, and the weight carded have much to do with this question ; for instance, one cannot expect to have the same working conditions in carding low Indian cotton at the rate of 1,200 lbs. for a 56-hour week, as one has with fine Egyptian at the rate of 300 lbs. In cards of the latter type felting ought not to occur in the ordinary routine of things, but the very large percentage of broken seed, leaf, and other foreign matter in the inferior qualities of short staples make it almost impossible to prevent felting.

**Damage to Flats.** The only way in which flats may be cleared after having become felted is by picking, either

by hand or mechanically. Many carders make use of the burnishing roller for this purpose, but although it may be to a certain extent successful in taking out the loose seeds and loose fibre, it cannot be relied upon to clean the flats thoroughly by eradicating the matted fibre and the wedged seeds at the roots of the wire. It is, moreover, a dangerous instrument owing to the necessity for setting the burnishing wire deep in order to reach the felting; this often results in the foundation-cloth of the flats being scratched or 'napped,' thus rendering it an easy matter for the flats to felt up afterwards. Hand-picking is a long and tedious process, also unsatisfactory; it is costly inasmuch as the operative engaged can do no other work in the meantime. Neither the spiral bristle-roller nor the burnishing roller possess the necessary qualifications for removing felting from flats; their action is a simple sweeping action and not a **picking** action; as before stated, all they can do is to drive out from the sides of the flats such matter as will penetrate through the teeth; with seed-choked flats one can readily understand the difficulties in this direction.

**Specially-designed Felting Remover.** The **Rhodes Patent Self-clearing Flat Cleaner, No. 66,** Fig, 59, has been specially designed to clear flats of all impurities; in other words, it may be termed a mechanical flat-picker with the

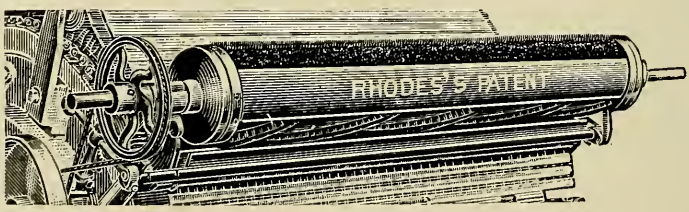



*Fig. 59.*
*Rhodes Patent Self-clearing Flat Cleaner No. 66. Codeword—Cleaner.*

addition of a cleaning brush, the Rhodes Flat Cleaner is a portable apparatus, being transported from card to card, and one will serve for a number of cards according to their condition and

according to the class of cotton in use. The section illustrated in Fig. 60 shews clearly the construction of the apparatus. A, is the central driving-shaft ; B, a spiral bristle-roller ; C, a wire-covered stripping roller ; D, a circular comb which collects the fibre, etc., from the two brushes whilst at work ; E, revolving end-discs containing the gear for driving B, C, and D ; F, comb-guard ; G, flat.

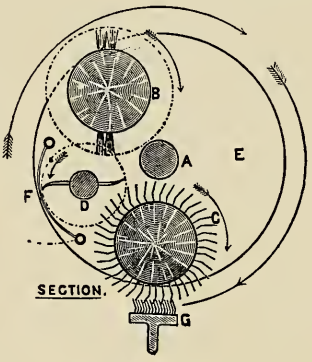



*Fig. 60.*
*"Rhodes" Patent Flat Cleaner.*

**Working position.** The apparatus runs in the steps of the card usually occupied by the ordinary spiral bristle-roller which it replaces for the time being. It is driven by the same rope from the same pulley as the latter. The rotation of the brush-rollers and comb is duplicate ; not only do they revolve around the central shaft A, but they rotate also upon their own axes, creating what is generally known as a 'sun and planet' motion. This peculiar motion results in the two brush-rollers **picking** and **sweeping** simultaneously.

**No injury to foundation.** The bristle brush B penetrates deeper than the wire brush C, the object being to prevent the wire points from reaching to the foundation and spoiling the cloth. The wire first attacks the felted or matted fibre and at the same time as loosening it, draws it up to the surface ; the bristle roller then extracts it with a similar movement and the comb automatically collects it. After the card has been cleaned the comb-guard F is opened and the comb cleared.

**Unique double action.** The Rhodes Flat Cleaner is the only stripping apparatus possessing two separate brushes revolving in the manner described and creating the double picking and sweeping action. Other brush-rollers are made with a combination of bristle and wire, but all possess the

simple rotation and are not capable of cleaning out flats when they have once become felted. We would like to make it clear that the Rhodes Patent Flat Cleaner is only intended for the express purpose of cleaning out flats which have become felted and seed-choked; we do not consider the **constant** use of any wire-covered stripping roller advantageous, but rather the reverse, owing to the fact that wire in constant contact with the flat-wire destroys to a large extent the carding points.

**Speed and capacity.** The speed of the apparatus is preferably a slow one, say 30 to 40 revolutions per minute. It should be set gradually down, allowing at the start the wire brush-roller to be set in about 1/16th, then gradually feeding deeper as the felting is removed. With careful setting into the flats, the apparatus will clean out the dirtiest card in about two days. Flats, simply seed-choked without felting, may be cleaned in one day.

# Hurst's Patent Flat Brush Cleaning Motions.

## Anti-Felting Attachments.

IN the foregoing we have dealt with the method of 'removing' felting, and several of the causes of felting, some preventible, others incurable, but there is one great evil which exists on practically all cards, viz. :—the incorrect, or rather the incomplete method of operating the spiral brush roller and its comb, and the absence of the necessary mechanism to enable the brush to operate properly is in our opinion the greatest cause of dirty and felted flats.

**The Best Permanent Brush.** Properly operated, the ordinary spiral bristle-roller is the best permanent flat-cleaner extant, but up to the invention of the 'Hurst's Patent Flat Brush Cleaning Motions,' the brush was not in a condition to function to its full capacity.

The Brush-rollers need only be examined to verify this statement ; it will be immediately seen that the bristles are clogged or matted with fly and dust, and the back side of each line of spiral and also the spaces between the spirals are choked with the longer fibres ; the latter is cleared periodically by the card-jobbers with hand brushes, but the rows of bristle still retain and continue to accumulate the fly and dust.

**How Brushes become dirty.** The reason for this is not far to seek. The Spiral Brush Roller is usually rotated and not traversed, so that the bristles in their evolution operate upon the same flat wires with which they are adjacent, thus any irregularity in the length of bristles is reflected in irregular cleaning in straight lines round the whole circuit of flats.

The usual method of 'cleaning' the bristle roller is by means of a stationary comb set into the bristles. As the comb is composed of teeth set about 3/16-in. apart, it is obvious that the bristles will be combed in lines by each tooth, but the bristles **between the teeth** never come into contact with the comb teeth. Hence the impossibility of maintaining a clean bristle roller, with its natural corollary, dirty flats.

**The Cleaning Motions.** Acting upon the simple logical argument that dirty brushes cannot clean dirty flats, the inventor of the Flat Brush Cleaning Motions applied his attention to the necessary mechanism for not only cleaning the brushes but keeping them permanently clean. The outcome of his exertions was the **Hurst's Dual Patent Flat Brush Cleaning Motions, No. 140,** Figs. 61-62. These consist of two independent motions, viz.:—1st, a motion for traversing the bristle roller on its axis; 2nd, a motion for oscillating the comb teeth.

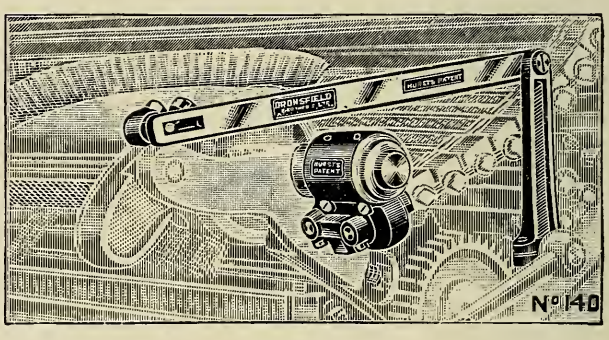
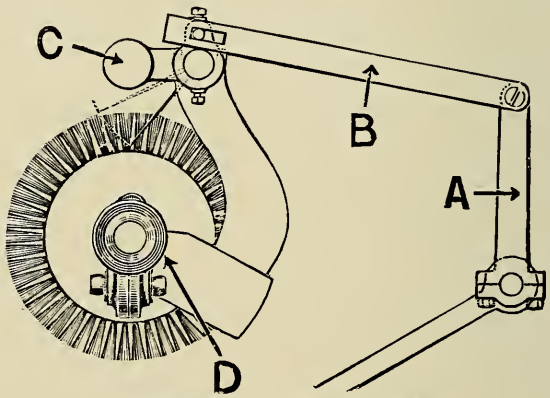



*Fig. 61.*
*Hurst's Patent Flat Brush Cleaning Motions.*
*Codeword—"Antifelt."*

The former is a Traversing Motion fixed on the shaft of the roller and arranged to traverse the brush so that the comb teeth clean line by line the whole of the bristles.




**WORKING POSITIONS.**

**A.—Rocking Arm. C.—Crank on Comb Stock.**
**B.—Link. D.—Traversing Motion on Brush Shaft.**

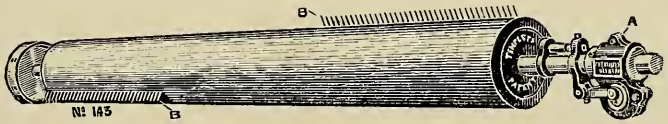
*Fig. 62.*
*Hurst's Patent Flat Brush Cleaning Motions, No. 140.*

The latter motion is in the form of brackets, which give to the comb teeth an in-and-out movement, a real combing action from base to point of the bristles, which is more efficacious than with the comb teeth fixed into the bristles. The motion is imparted through the brackets to the comb-stock end by the rocking shaft which actuates the flat-comb.

## The Cleaning of Woollen and Worsted Cards: 'Fettling.'

**Hand Fettling, Primitive and Costly.** The Cleaning, or as it is technically termed, the 'Fettling' of Swifts and Doffers of Woollen and Worsted Cards is a process which has from the introduction of Machine-Carding to quite recent date formed the subject of much discussion. Owing to the necessity of stopping the Carding Machine, running off the material and the attendant labour involved in the lifting out and the replacement of the Workers and Strippers, plus the actual hand-fettling of the Card surfaces, it will be readily seen that 'fettling' is a very costly process. Loss of production and damage to Card Clothing are directly attributable to hand-'fettling.'

**Hand-Fettling superseded.** Although enormous improvements in principle and in detail have been introduced into the manufacture of Woollen and Worsted Cards, up to a very recent date there has not been any satisfactory solution of any mechanical apparatus to replace the ages-old system of hand-'fettling,' but it may now be safely asserted that there is no further need of this cumbersome and costly process.




*Tempest's Patent Mechanical Fettler, No. 143.*
*Fig. 63.*
*Codeword—Fettler.*

**The Mechanical Fettler.** The Tempests Patent Mechanical Fettler, Fig. 63, is the invention of an English woollen manufacturer, who has given much thought to the evolution of the apparatus under review, and after long practical experiment in his own mill, the inventor has succeeded where so many have failed, in producing a long-desired and eagerly-sought apparatus, a practical Mechanical Fettler.

**Reasons for Fettling.** The reasons for 'fettling' are attributable almost wholly to the manner in which the surfaces of Card points become clogged with the oil or grease mixed with substances such as dirt, sand, and other foreign matter adherent to the wool. From the very commencement of the carding process with new or newly-cleaned Card Wire, the surface of points gradually becomes coated with this pasty mixture, until it is so clogged that it becomes necessary to stop the Card and clean the surfaces.

**Hand-Fettling drawbacks.** Fettling by hand is performed, as is well known, by means of fettling-combs set in a handle, and unless the operative is skilled and particularly careful, much damage can be done to the Card Clothing. The necessity of getting the Card restarted quickly, thereby minimising the loss of production is not conducive to careful manipulation of the combs ; the fettler is apt to rush the work and the surface of fine carding points is bound to suffer. Fettling by hand, or otherwise, should always be performed by combing parallel with the Card Wire, *i.e.*, down, never across the wire, but very often one sees the operative, after having combed downwards for a time, and having formed an accumulation of matter at the end of the stroke, reverse his comb and scrape up the accumulation across the wire. This damage is reflected in the reduced carding capacity of those wires damaged by this process. Other damage is caused, doubtless accidentally, by the men kneeling on, or even catching the feet on the Card Wire, when stretching over to get at distant parts of the swifts. Such damage is inseparable from hand-fettling.

**Working Position.** The Tempest Patent Mechanical Fettler consists of a Wood Roller fitted with shafts, and Traversing Motion. Fixed into the roller-barrel at intervals are lags into which Steel Pins are set. The Fettler takes the place

(permanently) of a Worker and runs in the same steps. When installing new Carding Machines provision may be made for the fitting of the Fettler, leaving the Workers intact. It is driven preferably from the Fancy Shaft by means of a strap or rope. The Traversing Motion causes the Fettler to oscillate from side to side so that the fettling pins will cover the whole of the Card Wire. One Fettler is required for every swift and one for every doffer Some manufacturers have been chary of reducing the number of Workers in order to install this apparatus, but in practice the Carding has proved to be actually better and cleaner owing to the cleaner conditions and uninterrupted functioning of the Carding organs.

**Speed.** To obtain the best results, the surface speed of the Mechanical Fettler should be about 20 per cent. faster than the surface speed of the Swift in the same direction. For Doffers a general speed of 140 revolutions may be accepted as satisfactory. The leather covering on the driving pulley may be varied in thickness to arrive at the correct speed. If the Apparatus is driven from the Fancy the pulley need not be changed, as the alteration in fancy speed will give automatically the right speed to the Fettler.

**Dirt always loose.** It will be seen that, by reason of the **continuous** fettling of the Swifts and Doffers, the card-wire does not become clogged but is kept constantly clean and in the best condition for Carding.

The minute particles of dirt are always kept in loose condition, thus enabling them to be deposited under the Carding Machine by their own gravity and the centrifugal action of the Swift. On examination of the dirt deposited by Cards cleaned exclusively with the Patent Mechanical Fettler, it has been found to be practically free from fibre, heavier and more earthy than the usual deposit.

**Far-reaching results.** There is much to be said for mechanical fettling of this description ; its effects are far-reaching and in the words of a manufacturer who has had the apparatus working for two years without any necessity to stop the Cards for 'fettling' (*i.e.*, Swifts and Doffers), 'the benefits derived are manifold, not only in the actual carding, but in the later stages of Spinning, Weaving, and Finishing.' The cards being kept constantly in clean condition the sliver is cleaner and more uniform, consequently the Yarn is better.

There is no flying of fancies when nearing fettling-time ; this in itself is a great evil eradicated.

**Workers and Strippers.** In the foregoing we have dealt only with the fettling of Swifts and Doffers. Workers and Strippers must still be fettled by hand, but owing to the prevention of the accumulation of dirt in the Swifts as explained, these naturally do not need the same amount of fettling as heretofore.

## 3. Burnishing of Top-Flats.

**Is burnishing necessary ?** It is a moot question whether burnishing of top-flats is a necessary or even a desirable proceeding. The card-clothing of top flats should not require burnishing if properly ground. When asked the reason for burnishing the carder will usually answer that it is necessary to remove the barbs or roughness on the wire points caused by the grinding, and that burnishing serves also to remove the fly-dust and short fibres from the foundation.

**Ill effects of burnishing.** Our opinion is, and we are corroborated by many, that burnishing destroys to a large extent the effect produced by grinding, that finely abraded point which has been already dilated upon in these pages, so necessary to good carding. Burnishing polishes the card points, that is to say, it destroys the effect aimed at and secured by grinding.

**Dust and Impurities.** If burnishing be necessary to remove the fly-dust, and impurities from the clothing, it should be resorted to **before** grinding, not afterwards.

**Burnishing sometimes necessary.** Heavy setting is the cause of 'barbs,' as previously explained. The grinding instrument, properly clothed and carefully set, will produce a finished result which should not require any burnishing to improve it; it is sheer waste of time to produce good carding points by grinding in order to spoil them afterwards by unnecessary polishing. It does sometimes happen, more often probably than it ought, that the wire is badly scored and barbed by careless setting, or through the bad condition of the emery combined with heavy setting. (See page 54). Perfect conditions cannot always obtain. In these cases it is essential to burnish, but this should be regarded as an extraordinary proceeding rather than routinal.

Section.

*Fig. 64.*
*Burnishing Roller No. 127.*
*Codeword—Burnisher.*

**The Burnishing Roller.—Care in setting.** The **Burnishing Roller No. 127,** Fig. 64 (section) is made exactly on the same lines as the stripping roller, Fig. 58, save that the wire is straight, not possessing any bend. In setting the burnisher, care should be taken to see that the wire does not touch the foundation cloth, otherwise the latter will be napped or raised, and in this condition it will form a basis for 'felting,' which cannot be eradicated but will exist so long as the clothing is allowed to remain on the flats.

# Part VI.

# General Information.

## 1. All About Emery Filleting.

**Invention of emery filleting.** In the old days all emery-rollers and card grinders of every description were covered 'solid,' *i.e.*, the bare surface of the roller was cemented or otherwise coated with some adhesive material and the emery grains dropped on ; the roller was then rolled with or against some instrument to produce as true a surface as possible. As long as the work was well done good results followed, but careless re-covering destroyed at once any possibility of true grinding and relegated the best apparatus to the level of the most primitive.

Recognising the inconvenience of having to send the grinding rollers away to a specialist for re-covering, the idea suggested itself to us that a tape or filleting might be useful for reclothing the rollers, in much the same manner as card-clothing is used for clothing rollers and clearers. This gave us the nucleus of the idea of emery filleting, and, after many experiments, and failures not a few, we succeeded in producing an emery-covered tape or fillet which was capable of being wrapped around the roller. However, a far greater difficulty presented itself, namely, the want of a roller which could be turned and ground perfectly true in order to provide a true base for the filleting without which the most perfect fillet would be useless.

**Invention of the 'Fillet' Roller.** Therefore, means had to be adopted to provide such a roller, and the outcome was our patent Long Steel Grinding Roller with special adaptation for covering with emery filleting (Figs. 37 and 40). Thus the

emery filleting became a substantial marketable commodity, and to-day the '**Atlas Brand**' **Emery Filleting** is to be

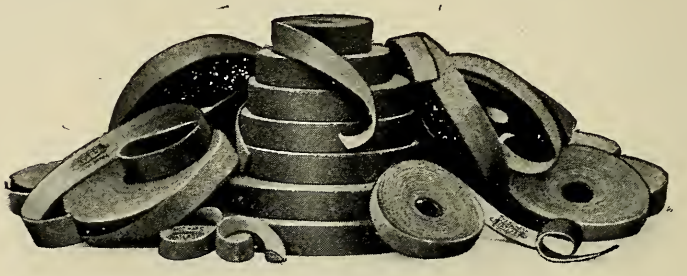


*Fig. 65.*

*'Atlas Brand' Emery Filleting. Codeword—Atlasbrand.*

found in every manufacturing country of the world.

**The Universal Card-grinding Abrasive.** After many improvements in the manufacture of emery-filleting, the addition of our patent 'grooving' method, and our latest successful experiment in rendering the filleting permanently flexible in all climates without the necessity of dampening, 'Atlas Brand' emery filleting occupies to-day the position of being the universal standard card-grinding abrasive.

**Benefits of 'grooving.'** Emery filleting is a simple production consisting of a linen webbing foundation covered with emery, and the surface of grains is either left in the 'plain' state, or 'grooved.' Our introduction of the method of grooving the surface of grains is conducive of three main beneficial results; the following are the advantages derived from grooved as against plain filleting. (These remarks apply equally to rollers covered on the 'solid' method.) Firstly, the filleting **lasts longer**; secondly, the grinding is accomplished **more quickly**; viz.—in half the time; thirdly, the card-points ground are sharper and last longer.

**Why grooved emery is best.** The reason for this is explained as follows. The emery grains are of the angular type; now, if these grains were simply dropped on to the cemented surface of the fillet, it would simply be 'plain'-covered, but in the truing-up process the sharp points of the grains would be forced down and the surface would become a series of mingled sharp points and flat sides of grains without any certainty of regularity. It may be computed that 50% of the best cutting points are buried.

In grooving, the sharp angular points of the grains are forced up into grooves of such a pitch, that as nearly as possible one grain of emery occupies a line; the result is a saw-toothed effect (Fig. 66). For all practical purposes two pitches of groove are sufficient, a fine pitch for No. 40's and No. 7's with 16 grooves to the inch, and a coarse pitch for No. 6's and No. 5's with 8 grooves per inch.

Groove Section.

*Fig. 66.*

**Every grain in action.** In this way the full obtainable cutting power of every grain is brought into action with the further advantage of having each line of grains acting upon a given quantity of card-teeth. The surface of grains is so trued up in the grooving and testing process that in testing the filleting mounted upon a revolving cylinder, a tool sliding upon a true slide will touch the top of every groove or ridge. This test is applied to all our filleting previous to packing for shipment.

**Groove for use, not appearance.** As will have been observed, the filleting is grooved for practical reasons, and not to please the eye. A fine grain of emery grooved with a coarse pitch will **look** much better than the correct thing, but it will not be nearly so useful, inasmuch as the quantity of grooves determines the grinding power of the filleting by exposing to the surface in serrated rows the corresponding number of grains.

**'Atlas Brand' Emery Filleting.** The original emery filleting patented by ourselves is stamped every yard on the back of the web with our trade mark, Fig. 67, and the following words :—'**Atlas Brand**;' **guaranteed 'A' Quality.** None other is genuine, and we ask our clients to protect both themselves and us by assuring themselves that they are getting what they ask for by seeing that this mark appears.

*Fig. 67.*

## 2. The Care of Grinders.

**Keep grinders perfect.** Speaking of the uses of card-grinders generally, it should be borne in mind that the condition of each and every grinding instrument determines the quality of the work produced by the grinding operation. Take a long grinding roller for instance; when first put into use the roller may be practically perfect in every way, true and well-balanced, but this truth must be maintained every time the roller is covered. Hence, the emery filleting should be perfectly even in thickness and well wrapped without creases or 'kinks.'

**Re-cover frequently!** Emery filleting should be kept on hand in every mill, and every grinder should be re-covered frequently in order to obtain the best results as regards both point and truth.

**Appearances deceptive.** It is a mistake to imagine that, because the emery filleting still possesses a quantity of grains, there is life in it, and that one may continue to use it satisfactorily; this is a fallacy frequently met with. The emery surface may still look almost as good as new, but if the grains have lost those properties necessary to the grinding of carding points, previously explained (page 54), it is the wiser plan to replace the filleting with new.

**Aural setting and its drawbacks.** We have, in another section of this treatise, advocated 'light' setting. Now, when the emery is new and replete with sharp points or edges immediately it comes into contact with the wire a distinct rasping sound is heard, and this is the only indication to guide the operator in setting the grinding instrument. But as the emery wears and the sharpness disappears, the sound of contact is not so keen, and it becomes increasingly difficult for the operator to gauge by the ear the correct setting depth; in a word, from the attainment of a certain condition of the

emery through wear, setting becomes mere '**guess-work.**' To this may be attributed many, many cases of broken-out teeth, flats especially. We have had many such cases brought to our notice, and have always experienced that with more care in setting combined with more frequent re-covering of the grinders the difficulty has been overcome.

**Routinize the re-covering!** It is a wise policy to so routinize the re-covering of card-grinders that there will be no possibility of their running too long and causing damage to the card-clothing, and incidentally a deterioration of the carded sliver. This damage will amount to many times the cost of emery filleting; a few pounds more spent in emery filleting is a good investment in order to save hundreds of pounds in card-clothiug.

**Grinders precision tools.** Apart from the emery-covered surfaces of all kinds of card-grinders, particular attention should be paid to the other wearing parts. The shafts must, of course, wear like everything else; don't let this go on too long without attention from the maker. With a long grinding-roller the oscillation of the traversing motion will cause hollow wear upon the shafts in the grinding brackets with the result that the roller will rise and fall in its traverse; these hollow shafts should be periodically attended to, either ground true, or if too badly worn, fitted with new ends; see to the motion parts also; the wheel-grinder guide forks, screws and differential motion parts should also be periodically overhauled. Don't let the grinders run until something absolutely breaks or gives out before sending them away to be repaired. We lay stress upon this matter, as we wish to negative the idea that these points are of small account; it must be remembered that grinders are the instruments which are intended to keep the cards in order, and the cards will work well, moderately well, or badly, according to the condition of the grinding instrument. Keep the grinders in the best possible condition at all times; it will repay you to

do so, as you will have the satisfaction of knowing that, upon necessity, you have a tool of precision to fall back upon to help you out of your difficulty.

**Use Racks!** Don't stand grinders on their ends in a corner; they are liable to get their ends strained, or become damaged through being knocked down. Neither should they be hung against the wall, as the wall may be damp and

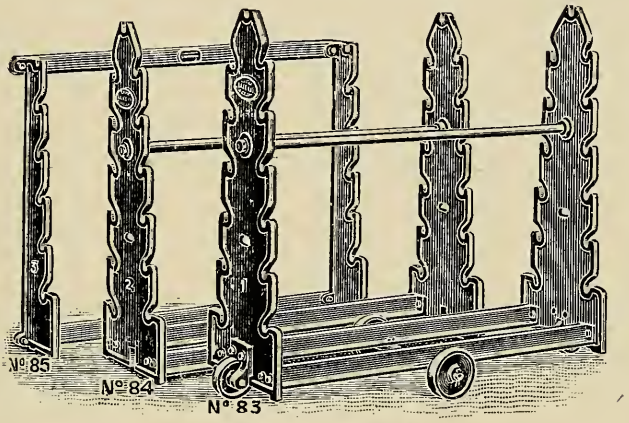



*Fig. 68. Grinder Racks.*
*Codewords—No. 83, Holder. No. 84, Carrier. No. 85, Recess.*

the emery covering will suffer. Grinders when not in use should be hung in Racks as illustrated in Fig. 68. This depicts three types of racks, the **No. 83 Rack with wheels, No. 84 Stand Rack,** and **No. 85 Single Rack** for fastening to an inside wall or partition. The Racks are also useful for Strippers and Burnishers.

**How to cover grinders.** A few hints regarding the manipulation of Emery Filleting would probably be acceptable to Carders.

1. Store the filleting in a dry room.
2. The filleting should simply be wrapped on the rollers; no glue or cement is necessary.
3. Don't dampen the fillet; it is now made so that it will retain its flexibility without necessitating dampening.

4. Mount the roller in a pair of steps or brackets, and attach a handle to one end. Let one man turn while the other guides and stretches the fillet.

5. Commence with the single slot at the left hand, (Fig. 69) ; pass the fillet through and secure the end to the flange by the clamp. Then wrap, keeping the laps close together, until the end of the roller is reached.

*Fig. 69.*

6. Before passing the fillet through the nearest of the three slots at the right-hand (Fig. 70), secure the fillet to the roller-flange ; it is worth while to get a small hand-vice for this purpose. Then pass the end through and secure.

*Fig. 70.*

7. Trim off the overhanging edges with a chisel or half-round file.

8. After re-covering, let the roller stand in a warm, dry room for a few hours to allow any natural absorption of dampness to evaporate. The roller will then be ready for use.

## (3) Wrinkles for the Carder.

1. Always keep your grinders well covered.
2. A few pence-worth of emery fillet saves £'s-worth of card clothing.
3. Keep a small stock of emery filleting for emergencies.
4. Examine the working parts of grinders frequently—guide forks, differential gears, etc. ; be careful to oil shafts and sockets ; clean out the screw-threads, particularly the reversing points.
5. Never attempt repairs of vital parts. Dronsfield Grinders are **precision tools** made by specialists.

6. In 9 cases out of 10, amateur repairs of grinders are a failure.
7. Keep the grinders in racks when not in use (See Fig. 68) ; don't stand them on their ends.
8. See to the alignment of the brackets ; otherwise hollow grinding will result.
9. Grind **light** and **often,** rather than heavy and infrequently ; this is the only way to keep cards up to 'concert-pitch.'
10. If the 'edge' of the emery is gone, replace the emery fillet. Don't take it for granted the emery is alright because it **looks** good. Smooth emery only polishes ; it does not grind carding points.
11. As long as 'setting' is done by the ear, so long will smooth emery cause damage to the wire.
12. Broken-out wire, particularly in top-flats, is one result of using worn-out emery. The cause of this is 'buckling' through heavy setting, in the attempt to get the right (?) sound of abrasion.
13 New, sharp emery causes a brisk 'hiss' when in contact ; worn emery has lost this capacity, consequently the operator sets too deep in endeavouring to procure the right (?) sound.
14 There is probably no accessory in the mill **on which so much depends** as the card-grinding instrument.
15. It is the **Carder's best friend** and ought to be treated as such.
16. Grades of emery.—For hardened and tempered steel wire, use No. 40 and No 7 ; for mild wire, use No. 6 and No 5. The first two are fine, the latter two coarse ; these No's should be used according to counts of card-clothing
17. Grinders should be balanced so as to run at high speeds.
18. There are grinders and grinders. The best are, in the end, cheapest ; the cheapest are never the best.

# The Revolving Flat Card.



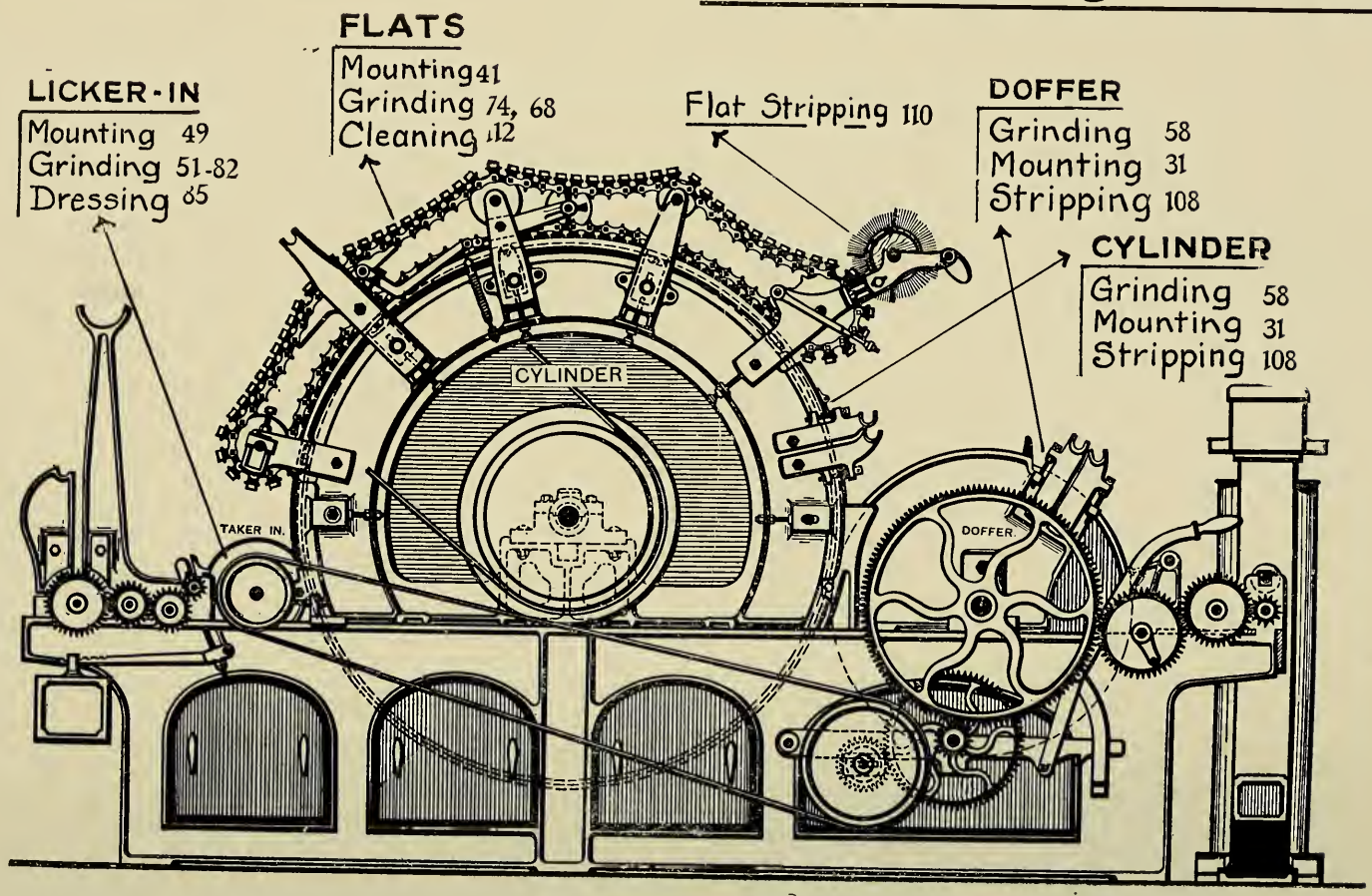



Fig. 71.

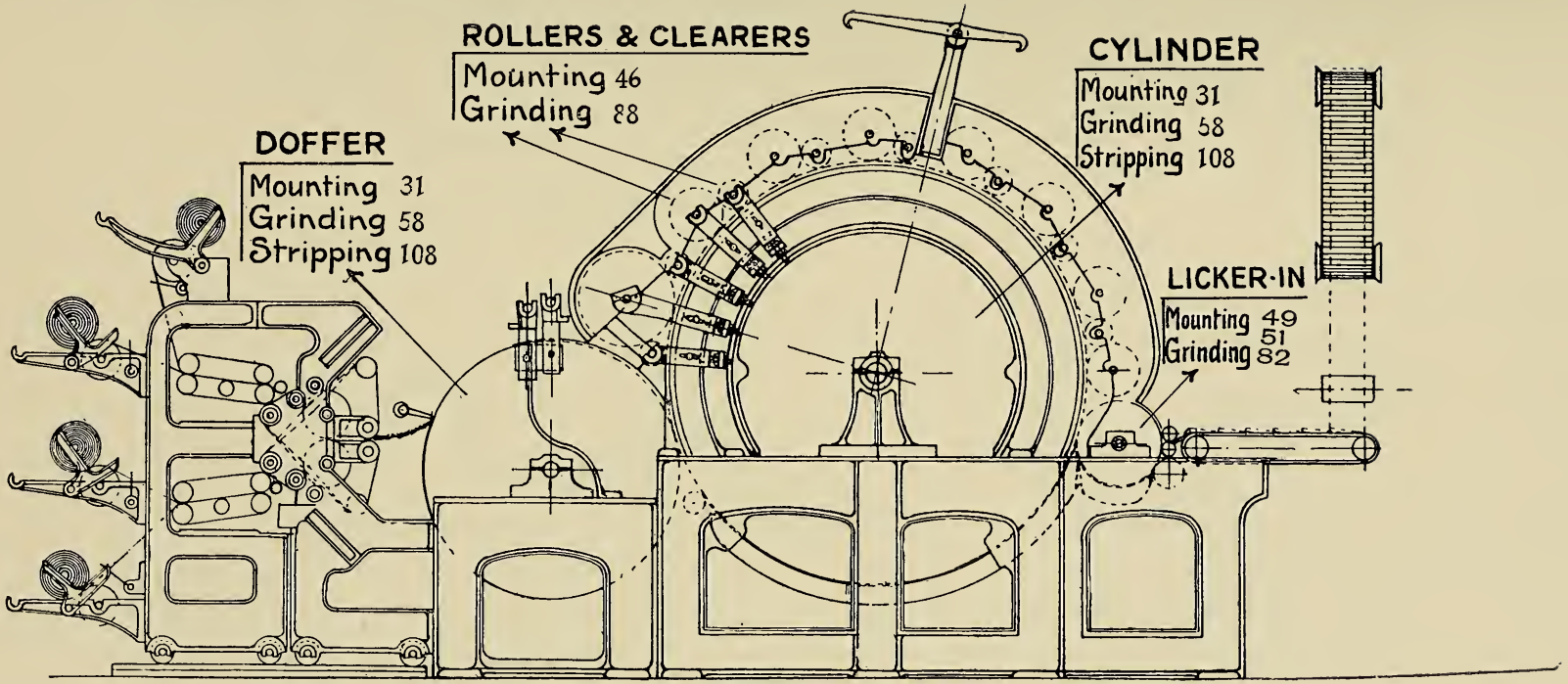



Fig. 72.

# Cotton Waste Finishing Carding Engine

## With Leather Tape Condenser.

# Woollen Cards.

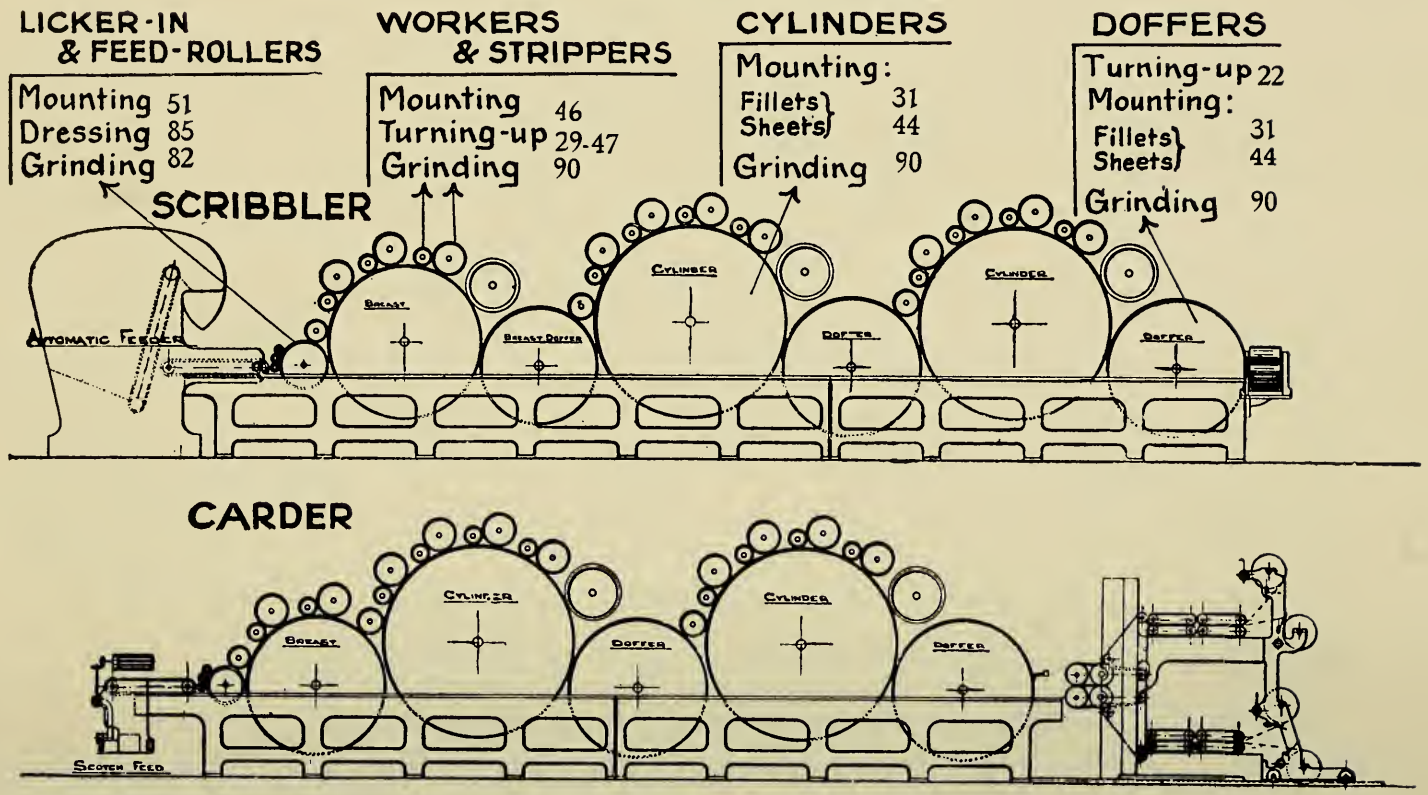



Fig. 73

# The Card Raising Machine.

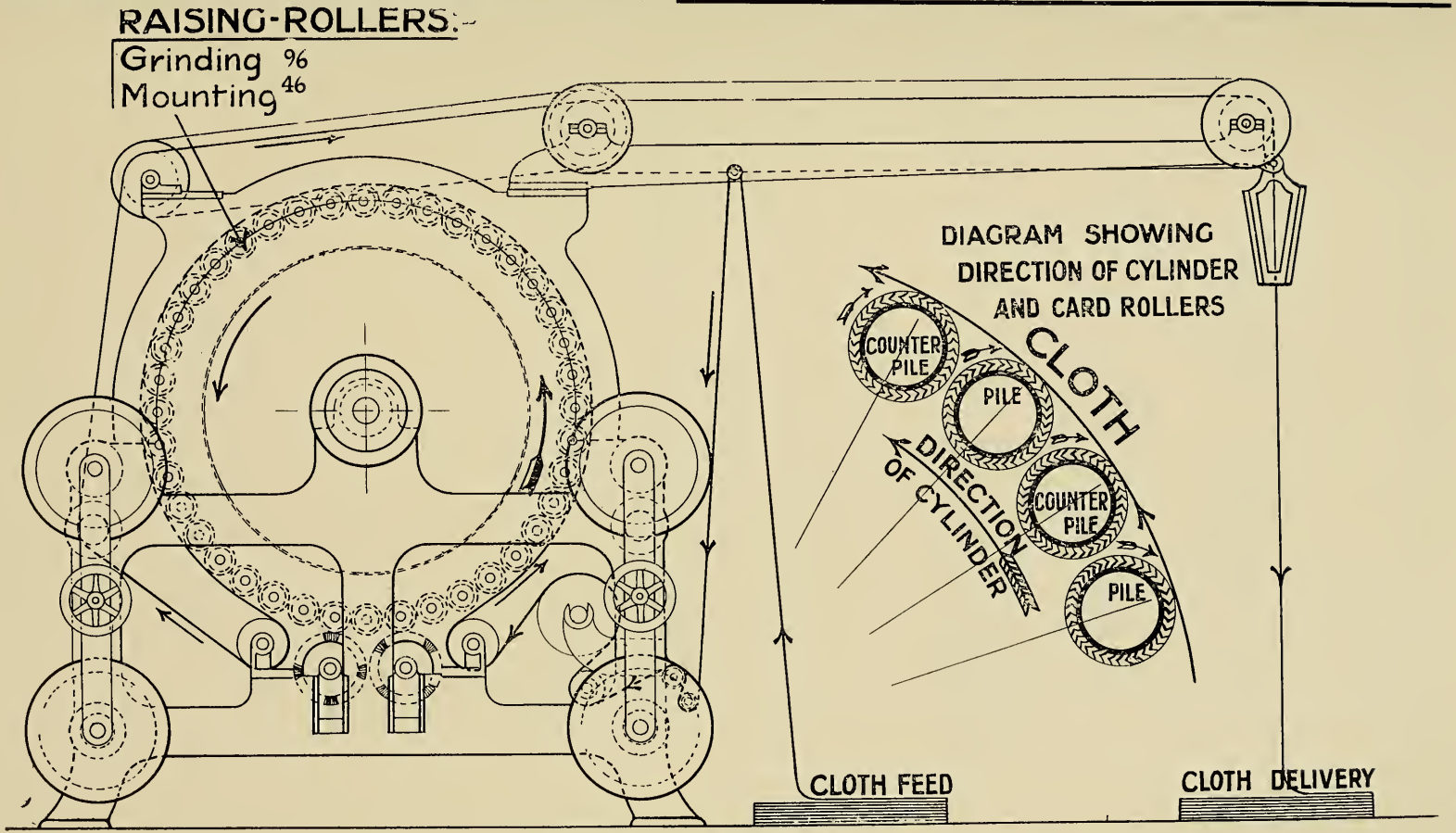



Fig 74.

Finis.

# All the Machines and Appliances

ILLUSTRATED HEREIN
(EXCEPT FIGS. 71 TO 74)
ARE MANUFACTURED BY
THE PUBLISHERS OF
THIS TREATISE:—

## Dronsfield Brothers Limited,

## Atlas Works, OLDHAM, England,

WHO WILL BE
HAPPY TO FURNISH ALL
FURTHER INFORMATION DESIRED.

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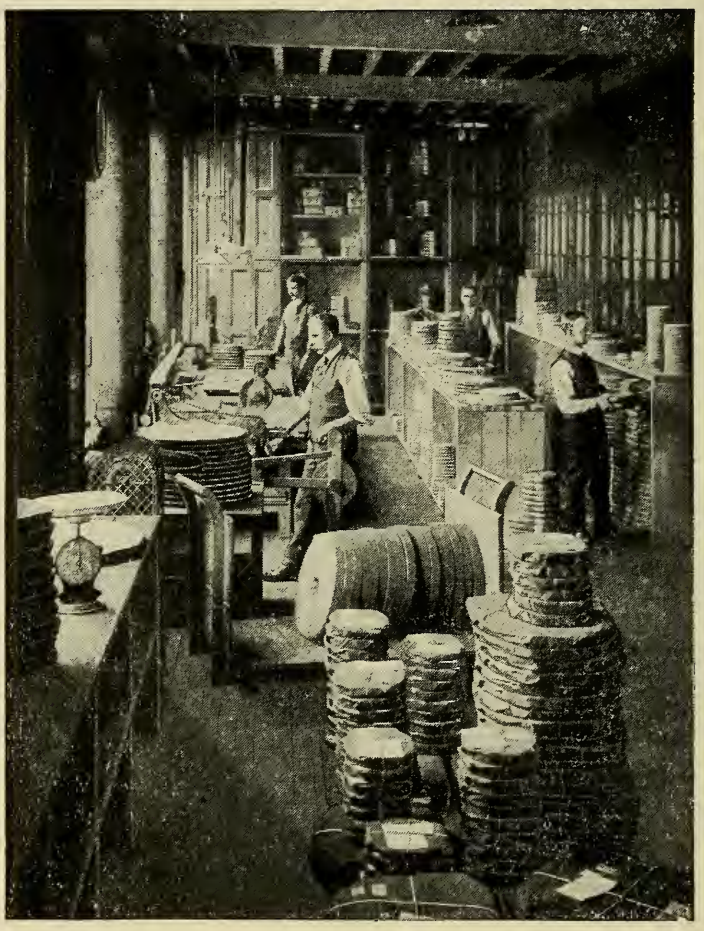
12th EDITION. GRATIS ON APPLICATION.



Dronsfield's Emery-Filleting.

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Testing and Packing Room.
Atlas Works, Oldham.

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# "ATLAS BRAND"

## EMERY FILLETING.

TRADE MARK

See the Trade Mark.

None Other Genuine.

Guaranteed "A" Quality. "The Only Quality We Make."

**Perfected Features:**

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Even Thickness.
Finest Grade of Emery: of the right kind.
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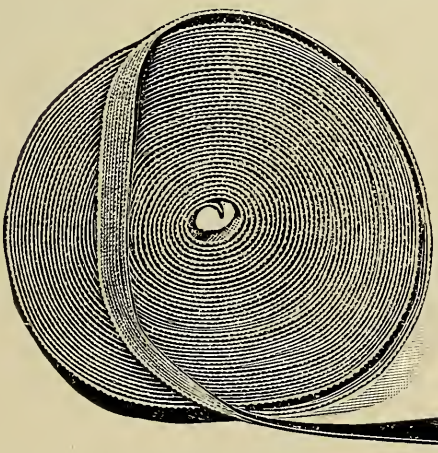

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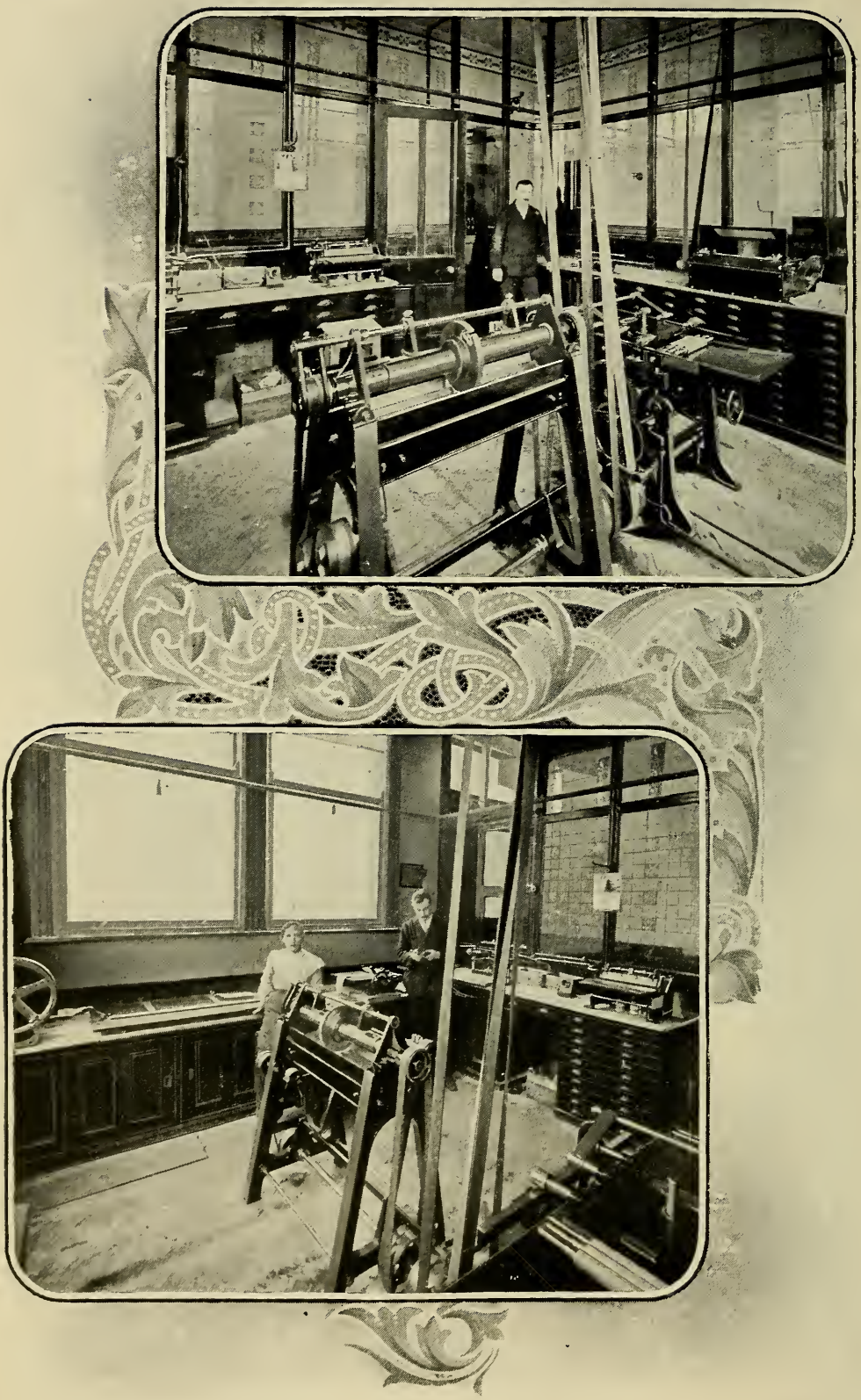
**"ALL ABOUT EMERY FILLETING."**—Page 123.



Roller-covering Department of a Modern Cotton Mill.

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# Patent Roller Covering Machines.

**The Covering is BETTER DONE; with LESS WASTE.**

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SPLICING MACHINE with measuring arrangement.
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ROLLER-ENDING MACHINES, 3 kinds.
AUTOMATIC ROLLER CALENDER.
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ROLLER TESTER.
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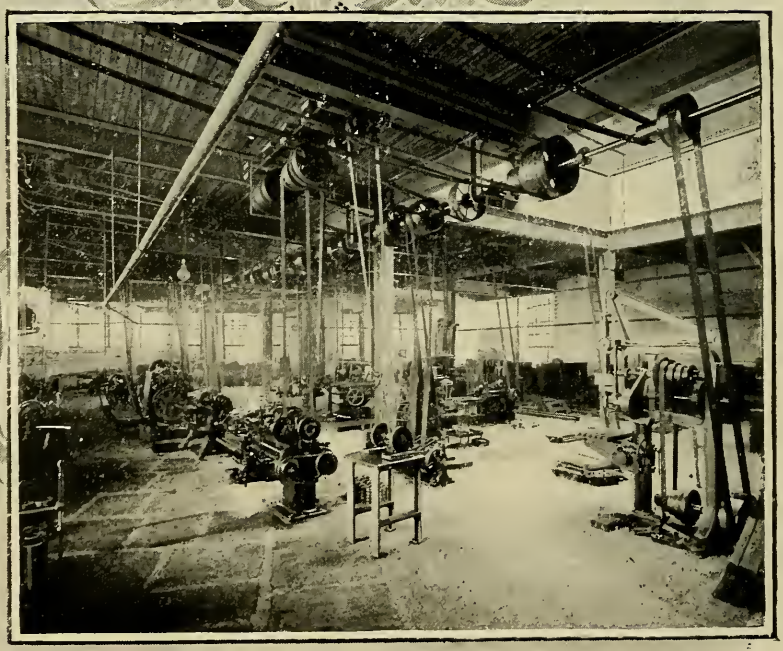

An Erecting Shop. A Machine Shop.

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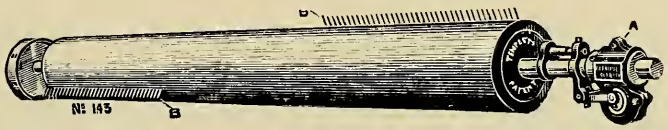
**For Woollen and Worsted Cards.**




The first successful attempt to Fettle Woollen Cards mechanically.

## A GREAT SUCCESS.

## FULLY TRIED OUT.

¶ Repeat orders from some of the world's best known manufacturers.
¶ Hand Fettling of swifts and doffers a thing of the past.
¶ Continuous running.
¶ Production improved and increased.
¶ Less lifting of workers and strippers.
¶ Greater regularity, clarity, and strength of sliver.
¶ No damage to card clothing.

*Sole Makers:*

## DRONSFIELD BROS. LTD.,

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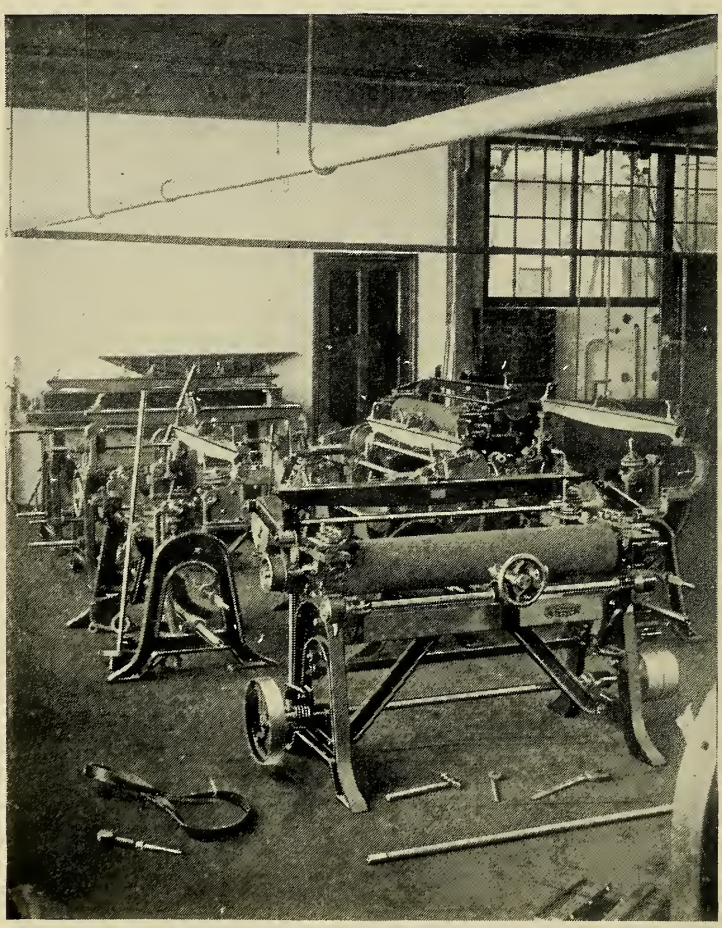
For full description see Article on 'Fettling.' Page 118.

# DO IT NOW!

**If you see anything in this book which you are assured will benefit you, get it;**

## DO IT NOW!

**Don't put it off until it is forgotten.**
**If you are a stripper and grinder, tell your carder about it. If you are a carder, tell your manager. If you are a Manager, order it. Do it now.**



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